

PROGRESSIVE
MEDICINE



G10.5

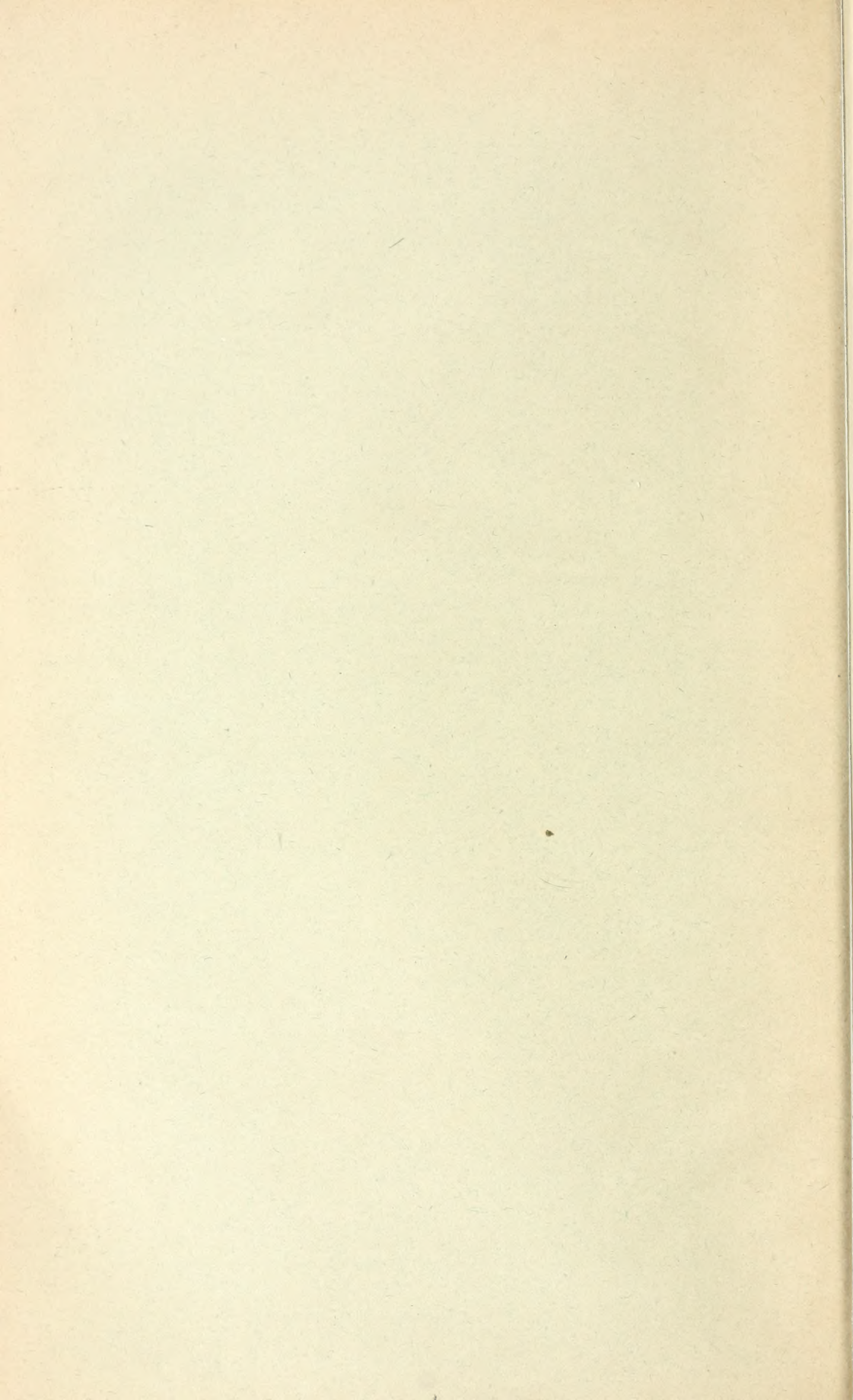
P94



Library
of the
Academy of Medicine,
Toronto.
932

Presented by

Dr. John Ferguson.





Digitized by the Internet Archive
in 2008 with funding from
Microsoft Corporation

CONTRIBUTORS TO VOLUME I.

CRANDALL, FLOYD M., M.D.

DA COSTA, J. CHALMERS, M.D.

HEKTOEN, LUDVIG, M.D.

PACKARD, FREDERICK A., M.D.

RANDOLPH, ROBERT L., M.D.

TURNER, A. LOGAN, M.D.(EDIN.), F.R.C.S.

Awarded Grand Prize, Paris Exposition, 1900.

PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES,
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES.

EDITED BY

HOBART AMORY HARE, M.D.,

PROFESSOR OF THERAPEUTICS AND MATERIA MEDICA IN THE JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA; PHYSICIAN TO THE JEFFERSON MEDICAL COLLEGE HOSPITAL; LAUREATE OF THE ROYAL ACADEMY OF MEDICINE IN BELGIUM, OF THE MEDICAL SOCIETY OF LONDON; CORRESPONDING FELLOW OF THE SOCIEDAD ESPAÑOLA DE HIGIENE OF MADRID; MEMBER OF THE ASSOCIATION OF AMERICAN PHYSICIANS, ETC.

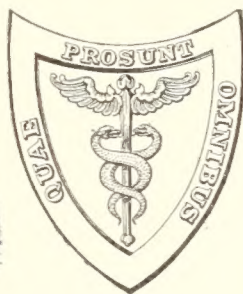
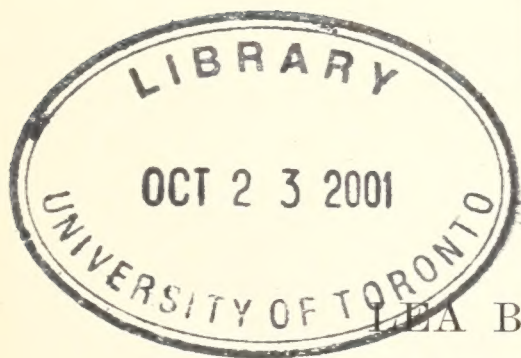
ASSISTED BY

H. R. M. LANDIS, M.D.,

ASSISTANT PHYSICIAN TO THE OUT-PATIENT MEDICAL DEPARTMENT OF THE JEFFERSON MEDICAL COLLEGE HOSPITAL.

VOLUME I. MARCH, 1901.

SURGERY OF THE HEAD, NECK, AND CHEST—INFECTIOUS DISEASES,
INCLUDING ACUTE RHEUMATISM, CROUPOUS PNEUMONIA AND
INFLUENZA—DISEASES OF CHILDREN—PATHOLOGY—
LARYNGOLOGY AND RHINOLOGY—OTOLOGY.



LEA BROTHERS & CO.,
PHILADELPHIA AND NEW YORK.

1901.

932

Entered according to the Act of Congress, in the year 1901, by

LEA BROTHERS & CO.,

In the Office of the Librarian of Congress. All rights reserved.



DORNAN, PRINTER.

LIST OF CONTRIBUTORS.

HENRY B. BAKER, M.D.,

Michigan State Board of Health, Lansing, Mich.

WILLIAM T. BELFIELD, M.D.,

Associate Professor of Surgery in the Rush Medical College; Professor of Surgery in the Chicago Polyclinic, Chicago.

JOSEPH C. BLOODGOOD, M.D.,

Associate in Surgery in the Johns Hopkins University; Assistant Surgeon to the Johns Hopkins Hospital, Baltimore, Md.

JOHN ROSE BRADFORD, M.D., F.R.C.P.,

Professor of Materia Medica and Therapeutics in the University College, London, and Professor-Superintendent of the Brown Institution.

ALBERT P. BRUBAKER, M.D.,

Adjunct Professor of Physiology and Hygiene in the Jefferson Medical College, Philadelphia.

JOHN G. CLARK, M.D.,

Professor of Gynecology in the University of Pennsylvania, Philadelphia.

WILLIAM B. COLEY, M.D.,

Clinical Lecturer on Surgery in the College of Physicians and Surgeons, New York, and Assistant Surgeon to the Hospital for the Ruptured and Crippled.

FLOYD M. CRANDALL, M.D.,

Adjunct Professor of Pediatrics in the New York Polyclinic; Consulting Physician to the Children's and the Infants' Hospitals, New York.

J. CHALMERS DA COSTA, M.D.,

Professor of the Principles of Surgery and of Clinical Surgery in the Jefferson Medical College, Philadelphia.

MAX EINHORN, M.D.,

Professor in Medicine at the New York Post-Graduate Medical School and Visiting Physician at the German Dispensary of New York.

WILLIAM EWART, M.D., F.R.C.P.,

Physician to and Joint Lecturer on Medicine at St. George's Hospital and Physician to the Belgrave Hospital for Children, London.

FREDERIC H. GERRISH, M.D.,

Professor of Anatomy in the Medical School of Maine, Portland, Me.

LUDVIG HEKTOEN, M.D.,

Professor of Pathology in the Rush Medical College, Chicago.

EDWARD JACKSON, M.D.,

Emeritus Professor of Ophthalmology in the Philadelphia Polyclinic.

RICHARD C. NORRIS, M.D.,

Instructor in Obstetrics in the University of Pennsylvania, Philadelphia; Physician-in-charge of Preston Retreat.

FREDERICK A. PACKARD, M.D.,

Visiting Physician to the Philadelphia and Children's Hospitals and to the Pennsylvania Hospital.

ROBERT L. RANDOLPH, M.D.,

Associate in Ophthalmology and Otology in the Johns Hopkins University, Baltimore, Md.

WILLIAM G. SPILLER, M.D.,

Professor of Diseases of the Nervous System in the Philadelphia Polyclinic, Philadelphia.

HENRY W. STELWAGON, M.D.,

Clinical Professor of Diseases of the Skin in the Jefferson Medical College, Philadelphia.

ALFRED STENGEL, M.D.,

Professor of Clinical Medicine in the University of Pennsylvania, Philadelphia.

E. Q. THORNTON, M.D.,

Demonstrator of Therapeutics in the Jefferson Medical College, Philadelphia.

A. LOGAN TURNER, M.D. (EDIN.), F.R.C.S. EDINBURGH,

Surgeon for Diseases of the Ear and Throat to the Deaconess Hospital; Assistant to the Lecturer on Laryngology in the University of Edinburgh.

CONTENTS OF VOLUME I.

	PAGE
SURGERY OF THE HEAD, NECK, AND CHEST	17
By J. CHALMERS DA COSTA, M.D.	
INFECTIOUS DISEASES, INCLUDING ACUTE RHEUMATISM, CROUPOUS PNEUMONIA, AND INFLUENZA	133
By FREDERICK A. PACKARD, M.D.	
THE DISEASES OF CHILDREN	237
By FLOYD M. CRANDALL, M.D.	
PATHOLOGY	291
By LUDVIG HEKTOEN, M.D.	
LARYNGOLOGY AND RHINOLOGY	371
By A. LOGAN TURNER, M.D. (EDIN.), F.R.C.S. EDIN.	
OTOLOGY	399
By ROBERT L. RANDOLPH, M.D.	
INDEX	433

PROGRESSIVE MEDICINE.

MARCH, 1901.

SURGERY OF THE HEAD. NECK. AND CHEST.

BY J. CHALMERS DA COSTA, M.D.

GOITRE AND EXOPHTHALMIC GOITRE.

IN order to properly treat diseases of the thyroid body it seems essential to understand the functions of that gland. There is much dispute as to its functions, and in consequence great disagreement as to the causation and treatment of its diseases. It is certain that the thyroid plays an important part in general nutrition. One view is that the function of the thyroid is to remove from the body certain deleterious substances which result from destructive metamorphosis, and the retention of which will produce toxic symptoms or even death. Another view is that the thyroid furnishes to the blood a secretion, which secretion is valuable or essential in nutritive changes, especially the nutrition of the nervous system. F. Blum¹ has made a series of experiments which he thinks prove that the functions of the gland are to render harmless toxins absorbed from the intestinal canal and produced by the putrefaction of albumin. He maintains that disease of the thyroid lessens its antitoxic power and permits active poisons to enter the system unchanged and attack the central nervous system or the kidneys. If these assertions be proved true they will cause us to modify or alter our views as to the cause and treatment of exophthalmic goitre.

Gauthier² adopts the other opinion and asserts that the secretion of the thyroid is an essential element in nutrition, and any pathological condition due to lessened nutrition is associated with diminished secretion of the thyroid (hypothyroidia).

Until the functions of the thyroid are definitely known, treatment for many conditions must be largely empirical. Enlargement of the normal thyroid may be gradual or sudden, and every enlargement is

¹ Münch. med. Woch., July 24, 1900.

² Revue de Médecine, May 10, 1900.

not to be regarded as a goitre. Alfred Stengel¹ points out that sudden enlargement of the normal thyroid may arise "in consequence of nervous excitement of various sorts: as a result of intoxications and various infections, at the onset or in the course of exophthalmic goitre, and sometimes in cases of ordinary goitre or malignant disease."

Kocher² dwells on the importance of remembering that thyreoptosis may be the real cause of a supposed asthmatic condition. Such cases are sometimes mistaken for asthma and a futile effort made to cure them with drugs. In some cases it is necessary to operate, and Kocher reports several cases successfully operated upon by him. In one case reported by Kocher the only evidence of an invisible goitre was paresis of the recurrent laryngeal and sympathetic nerves on one side.

A goitre which is not discovered by palpation may exist behind the sternum and clavicle. Such a goitre can usually be found by palpation during expiration.

The "wandering goitre," first described by Wölfler, is a goitrous thyroid which is extraordinarily mobile, and which is drawn down during inspiration until it passes partly or entirely back of the sternum or clavicle, to reappear on expiration. When drawn down during inspiration it may produce a violent suffocative attack. A retrotracheal goitre causes intense dyspnoea, and may also cause dysphagia. In irremovable infrathoracic goitre it is often possible to perform exothyropexy. In this operation the goitre is made to protrude from a wound and is sutured to the wound edges, and after the operation the gland shrinks.

F. W. Powers³ advocates treating simple goitre by the old method of injecting iodoform with antiseptic care. The preparation used is a saturated solution of iodoform in ether. From five to eight drops are injected into the thyroid at each sitting. The gland shrinks and hardens, and after a time, in order to inject the gland, the needle must be pushed through a hardened area to reach glandular structure. Powers treated 20 cases by this method; 16 were cured and 4 were notably improved.

It will be remembered that the injection of iodoform is regarded by Gersuny, of Tübingen, as an extremely valuable plan of treatment. He wrote about six years ago an article praising the plan. Instead of the plain ethereal solution employed by Powers, Gersuny uses 1 part of iodoform, 7 parts of sterile olive oil, and 7 parts of ether. Gersuny has explained his technique as follows: Grasp firmly the part to be injected and press it back toward the vertebræ. Endeavor to avoid the veins in inserting the needle. After the needle is introduced ask the patient to swallow. If the needle has entered the thyroid it will move with the

¹ University Medical Magazine, June, 1900.

² Centralbl. für Chir., July 7, 1900.

³ Medical Age, August 25, 1900.

gland in swallowing. An injection is given every second, third, fourth, or fifth day. It requires about sixteen injections to effect a cure. Gersuny treated 150 cases, and claims to have cured ninety of them. Injections of iodoform have been praised by Mosetig-Moorhof. Lücke has injected tincture of iodine, and Schwalbe has injected undiluted alcohol. Tillmanns, in discussing this method, says the patient should be recumbent during the injection, because otherwise fainting may occur. The same surgeon says the needle of an empty syringe is introduced, and then the piston is withdrawn. If the barrel fills with blood a vessel has been entered, and the needle must be withdrawn and reintroduced at another spot. Injections are only useful in parenchymatous goitre, and are never to be used for fibrous, colloid, or malignant goitre.

Bouffleur¹ sets forth his views on the treatment of goitre. He maintains that it is of the first importance to make the diagnosis early and to determine at this time, if possible, the nature of the enlargement. In struma he advocates the internal administration of thyroid extract or iodine and the local injection of carbolic acid or iodoform. If this treatment fails, he advises enucleation or partial thyroidectomy. Bouffleur removes a small adenoma by enucleation, a large adenoma by thyroidectomy. He believes that a cyst should be tapped and injected with carbolic acid or iodoform and olive oil, but if this proves futile it should be enucleated.

I would regard it as wiser to enucleate a single cyst than to tap and then inject it. Multiple cysts cannot be treated by enucleation; thyroidectomy is necessary in such cases. Tapping and injection may cure a cyst which has thin walls, but it is rarely resorted to at the present time.

If symptoms of compression exist and yet extirpation is impossible, Wölfler's operation of dislocation may be performed. J. Preindlsberger discusses this operation.² Dislocation may be necessary, because a growth has recurred and cannot be removed without performing total thyroidectomy. In this operation the gland is raised from its bed and fastened beneath the superficial muscles at a point where it does not make pressure upon the air passages. Preindlsberger, in the above-quoted paper, reports a case in which he performed this operation, the thyroid arteries being also ligated. The result was excellent.

James Berry³ reports a series of 72 operations for goitre. In 33 cases he performed extirpation (removal of a portion of the gland with a portion of the capsule); in 39 cases he performed enucleation (the removal of a cyst or growth within the gland). He does not consider that de-

¹ *Medicine*, November, 1899.

² *Wiener klin. Wochenschr.*, June 7, 1900.

³ *British Medical Journal*, July 7, 1900.

formity alone justifies operation, and he operated for deformity in only five cases. In three cases he operated because he suspected that the growth was malignant. The real indication for operation, according to Berry, is dyspnoea due to mechanical obstruction. This seems to us slightly too conservative. We think, with Shepherd, that rapid growth is an indication, even if there is no dyspnoea. Berry says there are two forms of goitre which most seriously threaten life: growths situated so low down that they are apt to be caught between the sternum and wind-pipe, and rapidly growing parenchymatous goitres in young subjects. He maintains that unilateral goitre, even when large, is rarely dangerous to life. Berry agrees with most operators that a general anæsthetic is dangerous, especially if there is much dyspnoea. The operation can be satisfactorily performed with the aid of eucaine or cocaine. In this series of cases there were three deaths.

Francis J. Shepherd¹ says that in this country simple goitre is usually unilateral and generally encysted, the cysts being single or multiple. In the interstitial or parenchymatous form of goitre the gland enlarges uniformly. Shepherd says this form is most commonly seen in young girls at the period of puberty, it increases in size temporarily at each menstrual period, and often gets well spontaneously in a few months. Shepherd points out that such a goitre, if not soft and vascular, is greatly benefited by the administration of iodine and thyroid extract.

“In all these forms of goitre the general health is apt to be affected, the patients are more or less nervous, are subject to breathlessness on exertion, owing to pressure of the growth on the trachea, and sometimes tachycardia; in fact, patients having the encysted solid forms are subjects of a kind of pseudo-Graves’ disease produced by the growth” (Shepherd).²

If medical treatment fails an operation is often advisable. If the goitre is growing rapidly, even if there is no dyspnoea, operation is necessary, for dyspnoea urgently calls for operation. In the simple cystic cases, if there are not more than two cysts and if the cysts are large, Shepherd, in common with most surgeons, advocates enucleation. Before enucleating a cyst Shepherd opens it and removes a portion, at least, of the contents in order to diminish the size. If the cysts are multiple and small, if the goitre is very large, if it is malignant, if there is diffuse interstitial goitre, and if Graves’ disease exists, he performs extirpation. In Graves’ disease and in interstitial goitre it is only advisable to excise one lobe.

In considering the proper treatment of exophthalmic goitre the theorist is in his element. Various operations have been proposed, each

¹ *Annals of Surgery*, November, 1899.

² *Ibid.*

one founded upon some theory of thyroid function or some hypothesis of thyroid disease. The theory that Graves' disease is due to hyperthyroidization because of hypertrophy of the gland is thus stated by Alfred Gordon:¹ "The function of the thyroid gland consists of extracting from the system a toxic product, accumulating and neutralizing it, before it is thrown into the circulatory system. The neutralization is performed by a special product or ferment secreted by the gland. In case the secretion of the gland is excessive, as in Graves' disease, the result is a pathological condition, and the organism becomes saturated with a toxic product, called thyroidin. Möbius, the great advocate of hyperthyroidization, says: The nearest cause of Basedow's disease is diseased function of the thyroid gland. He bases his theory upon (1) the contrast between this disease and other conditions which are based upon the defects of functions of the thyroid, as cachexia strumipriva, myxœdema, and cretinism; (2) to the goitre are added more or less the symptoms of Basedow's disease; (3) operations on the goitre influence the disease favorably."

Those who believe the above theory usually advocate partial or even complete excision of the gland. Many surgeons follow this plan (Kocher, Kümmell, Shepherd, and many others). Sometimes cure is effected, often great improvement is obtained; but very frequently, while the improvement is considerable, the patient remains far from well, and still suffers from nervous symptoms. In Graves' disease the operation is decidedly dangerous.² Gordon³ maintains that it is proved that hyperthyroidization is not the cause of Graves' disease, and that it is also proved that irritation of the sympathetic nerve is the real cause, a rather positive and radical assertion.

Gordon's conclusions are as follows:

"1. If the syndrome of the disease is the result of a mechanical pressure on the sympathetic nerve (tumor of the thyroid gland, etc.), remove the pressure, and if the symptoms persist, operate upon the sympathetic.

"2. If the syndrome of the disease is the result of reflex influence on the medulla, and through the last on the sympathetic nerve from some remote affection, as fibroid uterine tumors, nasal polyps, etc., remove the last, and if the symptoms persist, operate upon the sympathetic nerve.

"3. If the syndrome of the disease occurs during the course of any spinal or other organic nervous disease, abstain from operation.

"4. If there is no apparent cause, operate upon the sympathetic nerve.

¹ Philadelphia Medical Journal, June 16, 1900.

² Annals of Surgery, November, 1899.

³ Philadelphia Medical Journal, June 16, 1900.

"At any rate, never operate upon the hypertrophied thyroid gland. Medical treatment can be used if the patient refuses an operation, but never expect any permanent cure or entire removal of the symptoms."¹

The operation of removing the cervical ganglia of the sympathetic is attracting much attention, and is warmly praised by the advocates of the sympathetic theory. And yet the facts are not as yet ranged upon that side of the question. Gordon says dogmatically, "never operate upon the hypertrophied thyroid," and says this in spite of the fact that the best results have come from such operations. Rehn² makes a report upon exophthalmic goitre. In 177 cases extirpation was performed. Cure was obtained in 57.6 per cent. of the cases, 26.5 per cent. were improved, 2.3 per cent. failed utterly, and 13.6 per cent. died. In 32 cases the sympathetic was operated upon; 28.1 per cent. were cured, 50 per cent. were improved, in 12.5 per cent. the operation failed entirely, and 9.3 per cent. died. In other words, twice as many cures followed extirpation of the goitre as followed operation upon the sympathetic.

The mortality is slightly heavier after operation upon the goitre; but, possibly, if more than 32 operations on the ganglia had been done the two mortalities might have more nearly corresponded. Not too much weight should be attached to the large percentage of improvements reported after operation upon the sympathetic (50 per cent.). Improvement is always a relative item, the interpretation of which is considerably influenced by the temperament, the enthusiasm, and the accuracy of the reporter. Many "false facts," to use an expression from Junius, are conveyed by the word improved.

As long ago as 1895 Jaboulay divided the sympathetic on both sides in attempting to cure epilepsy. In 1896 Jonnesco removed the cervical ganglia from each side. Jonnesco claims that 60 per cent. of cases of exophthalmic goitre are cured by operation, and many of the remaining 40 per cent. are improved (see Rehn's figures). Some cases are temporarily benefited. It seems certain that in some cases at least the central nervous system is involved in exophthalmic goitre, as evidenced by tremor, mental disturbance, etc., and such symptoms are not improved by sympathetotomy. Those who believe in the operation assert that the superior ganglion sends sympathetic fibres to the eye, and also acts as the bearer of motor impulses to the eyeball, which impulses are delivered to Müller's muscle; the middle and inferior ganglia send secretory and vasodilator fibres to the thyroid gland; the inferior ganglia furnish cardiac accelerator fibres. If the superior ganglia are

¹ Philadelphia Medical Journal, June 16, 1900.

² Berlin. klin. Wochenschr., October 15, 1899.

removed the eyeballs retract ; if the inferior ganglia are removed, the rapidity of circulation is lessened ; if the middle ganglia are removed, the goitre shrinks. This is the theory. As a matter of fact, it is hard to conceive how excision of the middle ganglia can lessen the size of the bloodvessels in the thyroid gland, as dilatation of the vessels ought to follow division. Division might, of course, alter the amount or the nature of the glandular secretion. Recently a considerable number of attempts have been made to relieve glaucoma by removing the superior ganglia. It is claimed that some cases are notably benefited, others are only temporarily improved ; in many the pain is relieved.

Some surgeons ligate the thyroid arteries for exophthalmic goitre. Kocher has operated a number of times with good results in many cases, although in 34 cases there were 3 deaths. Rehn's statistics would indicate that ligation of the arteries has a mortality twice as great as thyroidectomy (thyroidectomy, 13.6 per cent. ; ligation, 28.6 per cent.). This is impossible to understand unless it be that the worst cases have been subjected to ligation. In fact, Kocher says that the 3 deaths in his 34 cases were due to the disease and not to the operation.

In exophthalmic goitre medical treatment should be given a careful trial, and medical treatment includes the employment of electricity. Regnier¹ points out that there is a tendency to disregard this valuable agent. The application of electricity is free from danger, and often gives distinct benefit and occasionally notable relief. Regnier employs a stable application of the galvanic current, and claims that it lessens the rapidity of the circulation and produces electrolytic changes in the thyroid. He takes an electrode of an area of 200 centimetres, attaches the negative pole to it, and fixes the electrode to the neck. The positive electrode has an area of 80 centimetres, and it is fastened over the thyroid. The strength of the current should be from 1 to 10 milliamperes, and an application should be made every other day.

If medical treatment fails, and if the condition grows worse and the symptoms cause the physician apprehension or alarm, it may be necessary to operate. The alarming symptoms may be due to pressure exerted by the goitre, excessive rapidity of the heart's action, nervous exhaustion, or prostrating diarrhœa. Up to the present time thyroidectomy seems to be the preferable operation in most cases, as it gives the highest percentage of actual cures. If thyroidectomy is contraindicated it is justifiable to ligate the thyroid arteries or to remove the ganglia of the sympathetic, although the later operation is still on trial and is a highly scientific experiment.

¹ *Le Progrès Méd.*, February 10, 1900.

FACE, NECK, LIPS, TONGUE AND JAWS.

Tumor of the Cervical Sympathetic Ganglia. Additional doubt is thrown upon the sympathetic origin of exophthalmic goitre by the report of a case by Burghard.¹ This patient suffered from a myxofibroma of the superior and middle cervical ganglia of the sympathetic, and Graves' disease did not exist. The patient complained of violent pain along the trunk of the occipital nerve, and a nodular mass was detected by palpation. There was also a distinct tumor in the anterior triangle of the right side of the neck just above the carotid bifurcation. When the tumor was exposed by an incision it was found to spring from below the internal carotid artery and to grow forward between the artery and the internal jugular vein. The tumor was carefully exposed, and was found to lie upon the longus colli muscle and the transverse processes of the second and third cervical vertebræ. A cord ran downward from the first tumor to a second smaller growth, and numerous branches ran in various directions from the first tumor.

The upper tumor was the superior cervical ganglion of the sympathetic, and the lower tumor was the middle cervical ganglion. Both tumors were extirpated. After the removal the pupil of the right side contracted, slight ptosis developed, and the eyeball became unduly prominent. The pain was completely relieved, and in consequence the patient refused to have the growth removed from the occipital nerve. For some days after the operation there was headache, but the vessels of the skin of the face did not dilate.

Examination of the growth microscopically showed it to be a myxofibroma.

Myxomatous growths of nerve sheaths are not very uncommon, and are usually multiple. "They often produce serious functional disturbances in the form of neuralgia or paralysis."² It is very important to remove myxomata early, because they are excessively apt to become sarcomatous. Abbe has reported a case of fibrosarcoma of the cervical ganglia, and collected forty-three cases of multiple neuromata in which the sympathetic was involved.

Facial Actinomycosis. Human actinomycosis is not so rare as formerly it was thought to be. It is impossible to make a certain diagnosis without the use of the microscope. As Porter³ says, it is practically impossible to make a clinical diagnosis. The primary lesion is in the mouth, and often it is impossible of identification, or escapes detection. Even when the primary lesion is insignificant the secondary lesions of the

¹ Medical Press, 1900, No. 3176.

² Senn on Tumors, 2d edition.

³ Boston Medical and Surgical Journal, September 13, 1900.

jawbone, cheek, or neck may be very extensive. The lesion is at first an indurated, reddish papule, which increases in size and develops necrotic areas and branching sinuses. It sometimes happens that an area of actinomycosis heals at one part as the disease spreads at another part of the infected region. Porter¹ says the persistence or recurrence of abscesses about the jaws which are not tubercular should make the surgeon think of the possibility of actinomycosis. If granules of a sulphur yellow exist in the discharge they should excite suspicion, but Porter shows they must not be regarded as proof of the existence of actinomycosis. Proof is obtained only by finding the fungus by means of the microscope.

Porter,² in the above-mentioned article, reports eight cases of actinomycosis, and suggests that the disease has a tendency to self-limitation. His reasons for thinking so are as follows: It cannot be a very rare disease, and yet very few cases are seen in hospital practice. The inference is that many cases are regarded as common abscesses and recover by spontaneous evacuation or after simple incision. Microscopical study shows that the fungi are not often found in great numbers in the wall of the abscess, though quantities exist in the granules which are contained in the pus. The inference is that the connective tissue is a barrier to the spread of the disease. In spite of the favorable course pursued by many cases in some instances the disease is very intractable or utterly incurable. Probably the majority of cases will recover after incision, curetting, and cauterizing with chloride of zinc solution. In some cases radical excision is necessary. In any case administer iodide of potassium, in doses of gr. xx, three or four times a day.

Iodide of potassium was used successfully to treat lumpy jaw in cattle in 1885, and many human cases have been successfully treated with this drug. It is not germicidal to the ray fungus, but confers benefit by increasing local tissue resistance. Jurinka has pointed out that when a patient is taking this drug iodine compounds are found in the pus. Van Hook³ thus describes the treatment: "We should begin the treatment of actinomycosis, then, in all accessible forms of the disease by the simpler surgical procedures, regarding the process not as a malignant one, but as a malady which, under favorable conditions, can be overcome by the tissues. Potassium iodide is to be employed as an adjuvant in these cases, and as an independently curative agent in the inaccessible forms of the disease. In those forms of the disease in which the process has gone too far for successful extirpation the surgeon should open all accessible collections of actinomycotic

¹ Boston Medical and Surgical Journal, September 13, 1900.

² Ibid.

³ International Text-book of Surgery.

pus, split such fistulae as can be reached, scraping away the detritus, and, while continuing daily irrigations with suitable antiseptics, administer tonics and potassium iodide."

Alexander Strubell¹ reports a case of actinomycosis cured by repeated injections of a 3 per cent. solution of carbolic acid (12 c.c. at a dose) and the use of hot compresses (at a temperature of 145° F.).

Cancer of the Skin. Surgeons believe that the knife is the best treatment for cancer of the skin, and that cauterization is of far less value. Cauterization is certainly inefficient in a deep carcinoma or in a nodular or fungating growth. This is admitted by Ravogli and other advocates of cauterization. It is in superficial epithelioma that the greatest claims are made for cauterization, and cauterization is often preceded by curetting; but even in superficial epithelioma we think excision preferable to cauterization in most cases.

The favorite local treatment with many consists in the application of arsenious acid. Arsenic has long been used for this purpose. The use of arsenic was gradually given up by the regular profession, and was finally almost abandoned, although quacks continue to employ it. Some ten years ago studies were begun by Hue and others to determine the action of arsenic upon carcinomatous tissue, and as a result of these studies the arsenic treatment again finds some advocates. C. Trunccek and S. Serny maintained, in 1897, that arsenious acid gives a distinct and invariable reaction with cancerous tissue, and will cure some forms of epithelioma. The method of using the drug is described by C. Trunccek.² The mixture used is:

℞.—Acid. arsenosi pulv. gm. 1
 Alcohol, ethyl. absol.,
 Aq. destillat. 5cc gm. 75—M.
 Sig. For external use.

The ulcer must be cleaned and dried, and in many cases it should be scraped. The mixture of arsenic and alcohol is thoroughly stirred and the tumor is painted with it. For about five minutes the part is allowed to dry while exposed to the air, and then, if there is no pain, another coat of the mixture is applied. There is sometimes moderate, but never "unbearable pain." No dressing should be applied. After twenty-four or forty-eight hours the eschar is removed and more arsenic is applied, and once a day the application of arsenic is continued. If the surrounding parts become oedematous no more arsenic is applied until the oedema passes away, when applications of smaller amounts are begun again. A thin, yellow crust forms, which becomes brown and finally

¹ Münchener medicinische Wochenschrift, May 8, 1900.

² Medical Record, June 2, 1900.

black. "By degrees it thickens and invades the whole surface of the neoplasm." After a time the edges loosen and begin to separate, and fluid of a greenish color oozes out. "Treatment is continued regularly until the eschar is freely movable, non-adherent to the subjacent tissue, and is easily removed or falls of itself. This eschar is essentially formed of cancerous tissue which has mortified under the influence of arsenic." After the removal of the scab one more application of arsenic is made to the ulcer. "If by the next day I find merely a yellowish crust which can be easily removed without causing any hemorrhage I may be sure that no cancerous tissue remains in the wound. If, on the other hand, there is a dark crust adherent to the subjacent tissue, the treatment is continued until the last cancerous cell has disappeared."¹ Trunecek says that during the course of local treatment "as the eschar thickens" the strength of the solution is gradually increased (1:150 at first, finally 1:100 or even 1:80). After the removal of the cancer the granulating surface is treated as an ordinary ulcer, using boric-acid ointment, although at intervals, Trunecek says, as a matter of precaution it should be touched lightly with the arsenical mixture (1:150).

Trunecek maintains that this remedy fails in a superficial non-ulcerated cancer because it does not destroy normal epithelial cells. In such a case he scarifies the surface or cuts away the skin before using the arsenic.

Trunecek² says "the curability of cancer by the above-described method depends in part upon the stage of development of the neoplasm and in part upon its location. In regard to the first, a necessary condition is that the ganglia be not indurated; in regard to the second, the tumor must be where it can be reached by the medicament. This can be done in the case of all non-relapsing cancers of the skin, no matter what their extent—cancers of the external auditory meatus, of the lips, and the buccal mucous membrane, wherever it can be reached, and cancerous lesions of the larynx in an early stage."

We agree with the statement that certain cancers may be cured with arsenic, but we would add as a corollary that most of these cases could have been more rapidly and more certainly cured with the knife. The fallacy in such a method is that it cannot remove the associated lymphatic glands. Trunecek is aware of this objection, and says he would not employ arsenic if the ganglia are indurated; but every surgeon knows that the glands are implicated long before they are perceptibly indurated, and they are often infected very early—a few weeks, it may be—after the appearance of the cancer. We believe that in most cases the caustic is futile, that its use gives the patient a delusive sense

¹ Medical Record, June 2, 1900.

² Ibid.

of security, wastes precious time, and keeps him from the radical operation until it is too late to perform it with any hope of success. We believe its use should be restricted to early and very trivial cases of superficial epithelium, particularly about the skin of the nose, cheek, and forehead, or to more advanced cases which decline operation by the knife. We would not in any case do as Trunecek recommends and employ the treatment in cancer of the nipple or breast. In cancer of the breast the axillary lymphatics are usually microscopically involved in from ten to twelve weeks, and it is worse than useless to remove the tumor alone, just as it is worse than useless to remove the breast alone. We condemn in unsparing terms anyone who cuts out the mammary gland and does not remove the contents of the axilla; we ought to condemn more emphatically methods which remove the gross mass of the carcinoma only and do not even remove the breast. Trunecek offers a suggestion of considerable importance, viz.: "This method is the only one possible in patients suffering from diabetes, hæmophilia, etc., in whom even a slight operation might cause dangerous or even fatal hemorrhage." It is certainly dangerous to operate on a diabetic, but it is not impossible. I removed a breast from a diabetic woman, and no dangerous symptoms arose, and I assisted Dr. Hearn in a similar case, which made an excellent recovery. A very important statement is the following: "By the proper application of our remedy we are enabled to ascertain at once whether we have to do with cancer or not." It is asserted that whereas arsenic may cause a violent inflammation in sound tissue, it will not form the black, adherent eschar which it produces in cancerous tissue. It is eminently desirable to test this statement by the careful observation of many surgeons.

Arsenic, when used in the careful and scientific manner advocated above, never produces very destructive inflammation. When used by charlatans it often does great harm. An instance of this was recently reported by André¹ to the Nancy Society of Medicine. A man was treated by a quack for a small, pedunculated growth upon the skin over the shoulder. A quack applied an "arsenic plaster," and after six weeks removed it and applied another. The second plaster was left in place for seven weeks. As a consequence a large slough formed, the joint was opened, the head of the humerus was exposed, and the tip of the acromium process and the outer end of the clavicle became necrotic. It was necessary to perform quite an extensive operation, and the man recovered, but with a joint almost completely stiff.

Cancer of the Lip. The imperative necessity of removing the glands anatomically related to a carcinoma, as well as extirpating the growth,

¹ Gazette Hebdomadaire de Médecine et de Chirurgie, March 1, 1900.

is generally recognized by surgeons when operating for cancer of the mammary gland. Strange to say, it is often lost sight of or disregarded in operating for cancer of the lip, and yet it is positively required in the latter case as in the former. Some surgeons remove the glands from beneath the jaw only if they are obviously enlarged, but this proceeding is as wrong as to remove the axillary glands only when they are obviously enlarged. In each case the glands are diseased for a considerable time before the disease is made evident by palpable enlargement. Frequently in carcinoma of the breast when glands cannot be felt before operation they can be felt after opening the axillary fascia, and sometimes in early operations, when glands cannot be felt even after opening the axillary fascia, a microscopical examination of glands and fat removed from the axilla shows cancerous involvement. In several of my cases of cancer of the lip in which no glands could be felt before operation they could be felt after making a submaxillary incision, and in one case in which no enlarged glands were felt after making the incision a subsequent microscopical examination of the glands and fat removed showed beginning malignant disease. The conclusion is that in cases of lip cancer the submaxillary region should be "cleared out" just as the axilla is "cleared out" in cases of cancer of the mammary gland. Charles N. Dowd¹ strongly advocates these views. Dowd says it is strange that the contiguous glands are not more often removed in operations for cancer of the lip when they are nearly always removed in operating for cancer elsewhere. "Hardly any surgeon would remove a cancer of the breast without removing the axillary lymph nodes, yet it is still common to remove a lip cancer and not touch the submental and submaxillary lymph nodes." Dowd says there are two possible reasons for this neglect: 1. Many cases are known to have gotten well by excision of the growth without removal of the glands. 2. There is a general belief that diseased glands can be detected by palpation. In answer to the first view Dowd points out that "although many patients do recover from whom the lymph nodes are not removed, many others die because they are not removed." Dowd quotes Fricke's statistics, and these statistics prove that lymphatic involvement is often present when the primary growth is not larger than a hazel-nut, and in one of his cases it existed when the sore on the lip had only lasted for six weeks. Fricke's statistics, quoted by Dowd, show that there is recurrence or metastasis in 32 per cent. of the cases operated upon. Dowd reminds us that Gussenbauer long ago pointed out that in thirty-two cases of cancer of the lip in which studies were made, glandular involvement was found to exist in twenty-nine cases. Dowd combats

¹ Medical Record, December 23, 1899.

the belief that diseased nodes can always be palpated. He says they can be in most cases, "but the examination is so often made without counterpressure within the mouth in just the right places that enlarged nodes frequently escape detection." "Again," says Dowd, "in some instances they are without doubt infected when they cannot be palpated before operation. It is far safer to make exploratory incisions in all cases than to rely on palpation to discover enlarged nodes." I would go further still, and would say that in some cases diseased glands cannot be palpated even after exploratory incisions, and it is far safer in all cases to remove the glands and fat from the submaxillary and submental regions, whether the glands seem enlarged or not, just as we remove the glands and fat from the axilla in a case of cancer of the breast, even if we do not detect enlargement after opening the axilla.

Dowd says three localities should be examined for nodes beneath the jaw: 1. Above the anterior part of the submaxillary salivary gland. 2. The space between the anterior bellies of the two digastric muscles. 3. Beneath the border of the jaw in the region about the posterior portion of the submaxillary salivary gland. Dowd wisely says that if the submaxillary lymph glands are obviously diseased, the region along the internal jugular vein should be explored, and he describes the operation as follows: "After cutting through the skin, the superficial fascia, the platysma myoides, and the deep fascia the mylohyoid muscle is brought into view. If this is pulled well forward, and if the two margins of the wound are also strongly retracted, the submaxillary salivary gland comes well into view. It may be loosened or drawn down so as to expose well its upper anterior surface, and the nodes which regularly lie above it there may be removed. If they appear infected and adherent to the salivary gland, that may also be removed, but it is seldom infected. The retractors should then be applied to the posterior part of the wound, and the tissues under the margin of the jaw should be inspected as far back as the parotid gland. Frequently two or three nodes are found just back of the submaxillary salivary gland, which should be removed.

"After this is accomplished the retractors should be put in the anterior part of the wound and the dissection carried forward to the submental nodes. There are usually three of them, and they lie about one-half to three-quarters of an inch below the symphysis menti, between the anterior bellies of the two digastric muscles.

"If the nodes beneath the jaw are found infected the deep chain of lymphatics which accompanies the internal jugular vein should be examined. The upper part of this chain can be reached through the incision already made, but if it is necessary to remove nodes from the

lower part of the chain an incision along the course of the carotid is desirable.”¹

Lupus. Many methods have been suggested for the treatment of lupus. Those which have been most employed are: Applications of blue ointment; application of the actual cautery; curetting, cauterizing with pure carbolic acid, and dressing with iodoform; and excision, followed immediately by the sliding of a skin flap so as to cover the raw surface, or followed later by skin grafting. Cases have been treated by the administration of Maragliano’s serum and by Koch’s lymph; by the local use of salicylate of camphor, pyrogallie acid, nitrate of silver, tar, resorcin, ichthyol, thiol, euophen, chloride of zinc, permanganate of potash, lysol, iodine, chromic acid, and various other agents; and by the internal administration of thyroid extract, phosphorus, the iodides, the salicylates, or arsenic. Dr. George C. Hopkins² commends warmly the treatment employed by Prof. Finsen. Some cases he treats by

FIG. 1.



Incisions used in reconstructing the upper lip. (Dowd.)

applying the rays of the sun. In the sun treatment he uses a glass lens “eight inches in diameter, fitted into a band of metal closed on the other side by a plain piece of glass, making a chamber, which is filled with water colored with sulphate of copper.” Some cases are treated with electric light, a lens of rock crystal being used. Hopkins reports several of Finsen’s previously unpublished cases. For instance, one case had been under treatment a few days over one year, and was discharged cured, having had 55 sun treatments and 151 electric light treatments. Another case was discharged cured after having had 34 sun treatments and 145 electric light treatments. Hopkins asserts that this treatment is “one of the greatest medical discoveries of the century just closing.”

¹ Medical Record, December 23, 1899.

² Philadelphia Medical Journal, October 27, 1900.

Henry W. Stelwagon¹ describes the Finsen Institute and the method of treatment employed, and says "the treatment seems successful."

Plastic Operation upon the Lips. Dr. Charles N. Dowd² describes a case in which it was necessary to remove a recurrent epithelioma of the upper lip and the cicatrix of the previous operation. The defect was filled in by "sliding in tissue from each side." Incisions were carried around the nasal alæ in order to permit sliding, and a crescent-shaped portion was excised from the right side (Fig. 1). It was not found necessary to remove a piece from the left side. The result of the operation was very satisfactory. Fig. 1 exhibits the method.

This method would obviously be of value in operating for hare-lip. The method, as Dowd says, differs from Diefenbach's in the removal of the crescent-shaped piece.

Fractures of the Bones of the Nose. Fracture of the nose is rather common. In some cases there is almost no deformity, but in other cases the deformity is very great. The amount of deformity depends on the success with which reduction is effected and the fragments are kept in place. If the surgeon is called soon after the accident it is usually possible to effect satisfactory reduction if the operator is careful and patient. The usual method employed to restore the fragments is to make pressure from within by means of a grooved director, a probe, or a pair of hæmostatic forceps, and to manipulate externally with great care. In the majority of cases the fragments remain in place after reposition, and if they do it is not advisable to apply external compression or support. Plugging of the nostril is unnecessary, and does no real good. In some cases where the bones sink down after replacement and produce "saddle-nose" it is advisable to employ Mason's pin—a method of treatment suggested by Dr. Mason, of Brooklyn, in 1880.

In fractures of the upper portion of the nose it is often difficult and sometimes impossible to replace the fragments and to retain them. Büdinger³ alludes to this, and says these fractures are often longitudinal, and there is depression, with a tendency to lateral deviation. In such cases Büdinger advocates, and we think wisely, the making of an incision and the application of sutures to hold the fragments in place. Such an operation is safe and easy, and will almost certainly be followed by union without disfigurement.

If a saddle-nose results from a fracture, can the deformity be relieved? This subject was discussed a few years ago by Dr. Keen, who advocated the introduction of a metal plate beneath the subcutaneous tissue, and reported a successful cure. The operation was first devised and prac-

¹ Philadelphia Medical Journal, August 18, 1900.

² Annals of Surgery, April, 1900.

³ Wiener klinische Wochenschrift, June 28, 1900.

tised by Mr. S. K. Ellison, of Australia, in 1886. In Dr. Keen's case a dentist took a cast of the nose and then constructed a wax nose of pleasing outlines and proportions. Taking this as a model, he made an artificial bridge, which was composed of two silver plates soldered together, the posterior plate having the outline of the bones and the anterior plate being the shape of the wished-for bridge. Many holes were drilled along the margin to permit of the entrance of granulations, and the plate was gold-plated. An incision was made through the skin and subcutaneous tissue; the subcutaneous tissue was separated from the deeper structures over an area equal in dimensions to the plate; the plate was introduced and the wound was sutured. I assisted Dr. Keen in this operation, and was greatly struck with the improvement in the

FIG. 2.



FIG. 3.

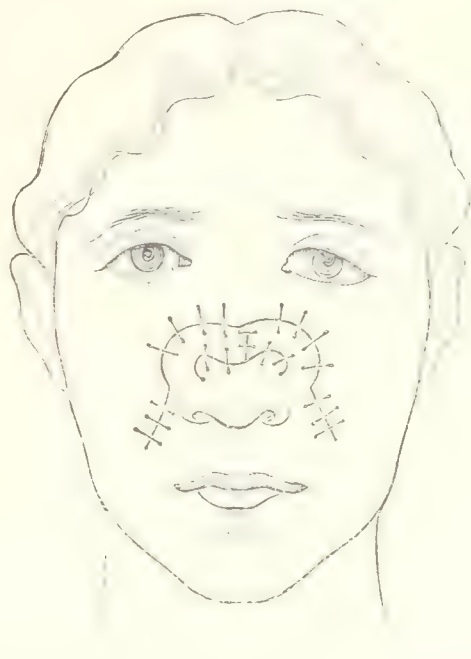


FIG. 2.—Diagram of Roberts' method of reconstructing a sunken-in nose. The dotted lines indicate the flaps taken from the cheeks to cover the opening into the nasal chambers left by the detachment and drawing downward of the cartilaginous nose. (ROBERTS.)

FIG. 3.—The cheek flaps sutured to close the opening. (ROBERTS.)

patient's appearance. The wound did well and the patient was apparently cured. I am somewhat doubtful, however, about the permanency of the improvement. It may endure, and it may not. In another operation of a like kind in which I assisted the wound healed and the patient went home; but later, as a result of a slight blow, the skin and subcutaneous tissue sloughed over the artificial bridge, and the plate came away. A nose containing a plate in the tissues is surely a point of least resistance, and even a trivial injury may destroy the most admirable operative success.

W. Moore,¹ of Australia, reported a very successful case, but the report only takes us up to twelve days after operation. In order to determine the permanency of the results a number of cases must be kept track of for years after operation. It is only in this manner that the value of operations for malignant disease can be determined. If cases of cancer were looked upon as cured if there was no recurrence a few weeks after operation it would be assumed that cancer was the most curable of diseases.

John B. Roberts² has devised a method for operating upon a sunken nose. Roberts' method is shown in Figs. 2 and 3.

Rhinoplastic Operations. These operations, Roberts³ tells us, "are required to repair the damages of syphilis and lupus and of intentional and accidental mutilations. American and Continental surgeons have very little experience with these operations except in cases due to syphilis and lupus." In India the operation is very common. Keegan says, in his treatise on *Rhinoplastic Operations*, that in India "traumatic mutilation of the nose is vastly more common than in Western Europe." Individuals are mutilated for revenge, and particularly for suspected marital infidelity, and the majority of the "noseless patients in India are women, almost invariably of the lower castes."

Many European and American surgeons are inclined to regard rhinoplasty as futile, because, as Holmes says in his *System of Surgery*, "the new nose, being formed only of skin, generally either withers away or remains flat on the face; and in either case the patient's appearance is not improved."

One reason why so many results have been unfavorable is because numerous cases are due to syphilis. As Roberts says, "the cases seen outside of India are usually much more difficult to bring to a satisfactory conclusion by operation, because the tissues which remain have been distorted and altered by the syphilitic or tubercular ulceration which has destroyed the nose. In many of these nasal deficiencies, due to disease, the internal bony and cartilaginous structures have been entirely destroyed. In some instances even the nasal bones which support the nose at its bridge are also absent as the result of the syphilitic necrosis."

Regarding the subject of rhinoplasty, we must all defer to the Indian surgeons; the experience of Europeans and Americans is very small, as in Europe and America the operation is only occasionally performed, even in the largest hospitals; in India it is performed frequently. Keegan tells us that in 1897 there were 152 rhinoplastic operations in

¹ International Medical Journal, June 20, 1899.

² Philadelphia Medical Journal, June 7 and 28, 1900.

³ Ibid., June 28, 1900.

India. He is a strong believer in the operation, and describes it in detail in his excellent book, *Rhinoplastic Operations*.

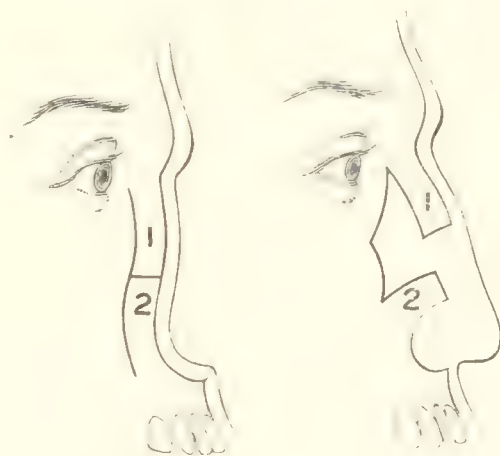
Dr. Roberts says that operations for total replacement are now undertaken in this country with much more confidence than formerly, because asepsis and improved technique make the results more perfect. He also says that if only the soft parts of the external nose have been destroyed a great deal can be done; and much can be gained, even when syphilitic ulceration has caused destruction of bone, cartilage, and soft parts, followed by deforming cicatricial contraction.

Some surgeons have used metallic bridges, but, as Roberts points out, although these appliances are sometimes worn with satisfaction, they often cause such great irritation as to make removal necessary. The construction of a new bridge from bone is shown in Fig. 4. The results are sometimes, although rarely, satisfactory. Roberts tells us that Sabine, of New York, constructed a new nose from a finger, which was fastened to the sides of the gap. "The finger nail was removed and the palmar surface of the finger split so as to form lateral flaps. The hand was then applied to the face and the finger stitched to the edges of the nasal cavity. After circulatory connection was established the finger was amputated from the hand through the first phalanx; and the end of the portion of finger, left attached to the face, was bent at the joint between the first and second phalanx, so as to make the end of the nose and its columella. A number of minor operations were subsequently done to improve the shape of the new nose."

There are three methods of rhinoplasty. As Roberts says, "the usual methods of rhinoplasty are the Italian, in which the tissues of the arm are attached to the stump of the nose; the French—sometimes called the German—method, in which the new organ is constructed from flaps taken from the cheeks, and the Indian method, in which the skin of the forehead is utilized in the nasal reconstruction."

The Italian method, known as the Tagliacotian operation, is rarely used at the present day. It has been performed in modern times by Sir William MacCormac, Berger, Warren, and others. According to

FIG. 4.



Langenbeck and Ollier split the nose vertically, laid the soft parts to each side, and then sawed bony flaps from the edges of the nasal aperture above and below on each side. They then bent these bony flaps forward to give support to the frontal flap or the replaced soft structures. (ROBERTS.)

Keegan, Hardie takes the flap from the flexor surface of the thumb, and Warren takes it from the front of the forearm, a little above the wrist. The operation has been adopted by some surgeons in order to avoid the large forehead scar which follows upon the Indian method; but, as a matter of fact, the disfigurement of the forehead produced by the Indian operation may be greatly lessened by the immediate insertion of Thiersch flaps into the gap from which the new nose has been cut. Roberts says that the Italian method requires the use of a complicated apparatus and the prolonged maintenance of a tiresome position, and concludes that the French method or the Indian method is

FIG. 5.

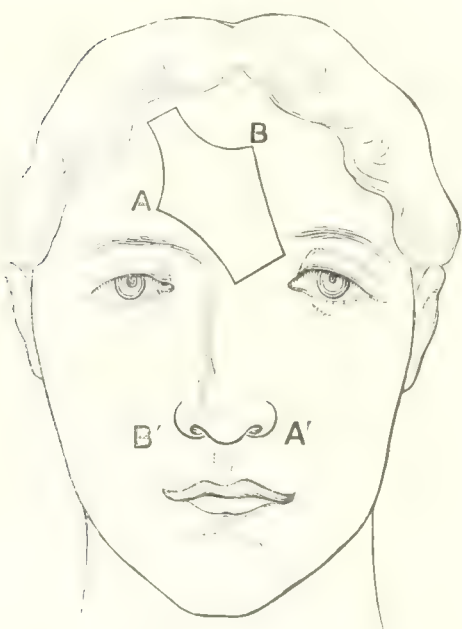


Diagram showing Keegan's outline for the frontal flap in rhinoplasty. When the flap is rotated downward the point *A* is stitched at *A'* and *B* at *B'*. (ROBERTS.)

preferable. Berger, in speaking of the Italian operation, says that young individuals "so soon become reconciled to the constrained position that they suffer practically no inconvenience; but with adults this tolerance is greatly diminished, and for that reason the operation would be almost impossible for patients of forty years old or upward" (Keegan¹).

Keegan² strongly advocates the Indian operation, and says that it gives greatly superior results to the French operation and saves the patient the severe discomfort of the Italian method. He has modified the ordinary procedure in several respects. The shape of the ideal forehead flap is shown in Fig. 5. This general form of flap is used when the cartilage, the alæ, and the columnæ have been destroyed.

Keegan says that the size and exact shape vary according to the case. The nose is marked out obliquely on the forehead. "The pedicle of the forehead flap should occupy the internal angle of the orbit, and care should be taken that the angular artery which supplies the pedicle be not wounded" (Keegan). In his recent book Keegan describes his operation in detail and illustrates the text with pictures.

Temporomaxillary Ankylosis. This may result from injury, rheumatic inflammation, inflammation arising in the course of or secondary to a febrile malady, gonorrhœal arthritis, tubercular disease, gout, and inflammatory lesions about the region of the joint. If ankylosis results

¹ Treatise on Rhinoplastic Operations.

² Ibid.

from joint lesion, operation is necessary, and the only operation worth considering is resection of the neck and condyle of the lower jaw. Greig¹ declares that this is the only operation to be thought of, and proceeds to describe it.

He begins his incision level with the superior border of the orbit, directly over the temporal artery, and carries it downward and somewhat backward to the zygoma, a finger's breadth in front of the external auditory meatus. The cut is then taken directly downward until it is level with the anterior attachment of the lobule of the ear. This incision divides the skin, the superficial fascia and the deep fascia, and the flap is retracted forward. The auricular branches of the superficial temporal artery are cut and tied. The auriculo-temporal nerve is back of the incision, and is not injured. The temporal artery and the superior branches of the facial nerve are taken forward in the flap and are not injured, although occasionally a few nerve filaments which go to the occipitofrontalis muscle are damaged. In some cases it is necessary to cut the superficial temporal artery at the upper end of the incision, and if it is cut it should be fixed with a suture ligature rather than with a simple ligature, because the fascia is so dense that the simple ligature might be rubbed off.

The next step is to divide the masseteric fascia along the margin of the zygoma; and this fascia, with the parotid gland, is retracted downward and forward. The incision of the fascia is transverse. The knife is now inserted beneath the zygoma, is carried to the condyle, and a vertical incision is made through the masseter muscle down to the inferior margin of the sigmoid notch. The muscular fibres are pushed away on each side by means of a periosteum elevator. The neck of the bone is cut through with a chisel, the line of the cut being oblique from below upward and backward. The bone should be first cut through at this lower limit, so as to be below the level of the internal maxillary artery, and also because of the pyramidal shape of the bone. This part corresponds to the apex.

Next the chisel is made to cut through the side of the joint and divide the base of the pyramid of bone. The portion of bone which has been isolated is left temporarily in the wound, the external pterygoid muscle is cut loose, and the bit of bone is removed. If the ankylosis involves only the side that has been operated upon it will usually be found an easy matter to separate the jaws; but if this is not easily carried out the chisel should be again inserted and the coronoid process should be chiselled through. The hemorrhage during this operation is very trivial, and the wound can be closed without drainage. In a case of

¹ Practitioner, December, 1899.

complete fixation of the jaw by firm cicatrices, the result of cancrum oris, Mr. Gamgee¹ excised a portion of the lower jaw in front of the cicatricial mass and established a false joint. The result was excellent.

Tumors of the Jaw. During a number of years I assisted Professor Keen in many formidable operations upon the jaw, and I became impressed with the conviction that some of the usually accepted dicta in regard to the limits of justifiable operation for malignant disease of the upper jaw are wrong, and that very extensive operations may sometimes be performed with great benefit. It is commonly thought that extirpation of a malignant tumor is not justifiable, except as a palliative measure, if the disease has invaded the orbit, if it has infiltrated the skin and the subcutaneous tissue, or if it has passed beyond the superior maxillary and palate bones. In one case of Dr. Keen's, however, the disease had involved the orbit and the frontal sinuses. The eye was removed, half of the upper jaw with the orbital plate was extirpated, the frontal sinus was gouged out, and a considerable portion of the floor of the sinus was removed with a gouge, exposing the dura. The soft parts above the upper jaw were invaded and had to be removed, and the great gap made by the removal of the jaw and the eye was filled by bringing down a flap from the scalp. This patient recovered from the operation and lived very comfortably for over three years. A similar case was alive and without recurrence three years after the operation. Without the performance of these formidable operations each patient would have been dead within a few months, and yet by this radical surgery one was given three years of comfortable life, and the other more than that. These two cases alone would seem to justify a revision of our views regarding the propriety of very extensive operations.

Dr. J. Paul Bush² has recently made a plea for more extensive operations in the treatment of malignant disease of the jaws, and has cited some very impressive cases that justify his conclusions. In a majority of the cases of sarcoma of the superior maxillary bone, if the bone is carefully and completely removed, there will be no recurrence for a very considerable time. Abbe³ says that if removal is thorough recurrence will often be deferred for many years. Even when recurrence takes place it may be possible to perform another operation. Johnson⁴ mentions one case in which there were several recurrences, operation being performed each time. After the fourth recurrence an operation was performed, and the patient had been free from all signs of the disease for six years, and is now free.

Abbe approves of preliminary ligation of the external carotid artery of one side in order to prevent bleeding during removal of the jaw.

¹ Lancet, December 2, 1899.

² Ibid., October 21, 1899.

³ Annals of Surgery, September, 1899.

⁴ Ibid.

That this procedure greatly lessens hemorrhage is certain, but it takes considerable time and prolongs the operation. The hemorrhage caused by removal of the upper jaw is usually easily controlled, even when the carotid has not been ligated. The ligation of the carotid is in itself an operation not entirely free from danger. Some surgeons expose the carotid, throw a ligature around it, and only tie the ligature if it may become necessary. Some practice what is known as temporary ligation, throwing a ligature around the carotid, drawing up the vessel into the wound, and arresting the bleeding by temporary constriction until the operation on the jaw has been completed. Then the ligature is removed and the wound in the neck is sutured. If preliminary or temporary ligation has not been practised the surgeon must work quickly, and when the hard palate has been sawed he must remove the bone in the shortest possible time. The moment the bone has been removed a large mass of gauze or a towel wrung out of hot water or hot salt solution is forced up into the cavity, and is held there with firm pressure for a time. This combination of pressure and hot water arrests many points of hemorrhage, and on removing the gauze the larger points of bleeding can be seen and the vessels can be tied. In inoperable tumors ligation of both external carotids may be employed in order to cause shrinking of the growth; and as a matter of fact this operation will sometimes retard the rapid progress of the growth.

A preferable method, however, in inoperable cases is extirpation of the external carotid arteries—an operation which was devised and first practised by Dawbarn, and which is far more useful than simple ligation. The external carotid of one side should be extirpated, and after a week has elapsed the other should be operated upon. In most cases ether is given, but in one case of recurrent sarcoma of the tonsil I was able to carry out the operation satisfactorily when the parts were under the influence of a local anæsthetic.

The operation is not difficult to perform. The artery is exposed and is tied just above the bifurcation. It is then cut across, and the end of the proximal segment is grasped with forceps and the artery is loosened and separated upward. As each branch is exposed it is tied and cut, and the artery is traced well into the parotid gland, is ligated there, and is cut off below the ligature.

I am persuaded that Dawbarn's operation is of distinct value, and that it is not used as often as it should be in advanced cases of malignant disease. It is possible that it might cure a case. It certainly distinctly retards malignant growth, and may even lead to marked shrinking of a growth; and it may be associated in some cases with radical extirpations in order to prevent recurrence, as was carried out in one case by Dr. Keen and myself.

Cleft Palate. Operation for clefts of the bony palate are always difficult and often unsatisfactory. Much depends on adherence to the minutest detail of preparation and operative technique. We reviewed some of the details of this subject in a previous number of *PROGRESSIVE MEDICINE*, and there seem to have been no notable additions to our knowledge during the year.

Carl Beck¹ reports a case of cleft palate in which an attempt had been made to close the extremely large defect by means of the Langenbeck and Davis-Colley operation. The attempt had been a failure, and Beck reoperated upon the case.

He lifted a flap from the side and near the base of the tongue, and sutured this flap and the freshened edges of the palate. The edges of the wound of the tongue were sutured, and the floor of the mouth was packed with iodoform gauze. During the next nine days a solution of boric acid was sprayed through the nostrils every fifteen minutes. The base of the flap was then divided, and one week after this the flap was sutured to the opposite side of the cleft of the palate. The result of the operation was satisfactory.

Alexander Hugh Ferguson² describes a new method of urano-staphylorrhaphy. The operation of which he writes has been performed on fifty-three patients. He wraps the child in a sterile sheet, the arms being extended along its sides, and fastens a towel wrung out of mercurial solution around the head, or else puts a rubber cap on the head. The child is put upon the table with a head-piece that can be raised or lowered. Chloroform is given drop by drop. The face, mouth, and throat are mopped with equal parts of alcohol and water, and the palate and pharynx are touched with a 4 per cent. solution of cocaine. If there is profuse secretion a hypodermatic injection of atropine should be given. The mouth-gag is inserted, and the surgeon sits at the end of the operating-table, the patient's head being thrown well back. It is necessary in the operation to have the patient sometimes more deeply anæsthetized than at other times, because the anæsthetist must not only give the anæsthetic, but must keep out of the way of the operator. This fluctuation is much safer than constantly keeping the patient profoundly anæsthetized. Ferguson thus describes his operation :

"1. *Making the Flaps.* With a slender, slightly curved, narrow-bladed knife, cut through the mucous membrane of the mouth about one-sixteenth inch from the edge of each segment, and divide all the soft structures to the mucous membrane on the nasal aspect of the palate, but not through it. (Fig. 6.)

¹ New York Medical Journal, June 30, 1900.

² Cleft Palate, Journal of the American Medical Association, May 19, 1900.

"2. *First Row of Sutures.* With a small, round, fully curved needle, not larger than one-half inch between the eye and the point, held in a suitable needle-holder, and threaded with fine silk, closely insert interrupted sutures by passing the needle through the free borders of the flaps from the mucous surface to the raw, and from the raw to the mucous surface, and tie them as you proceed from before backward, all the knots being situated on the nasal side. (Fig. 7.)

FIG. 6.

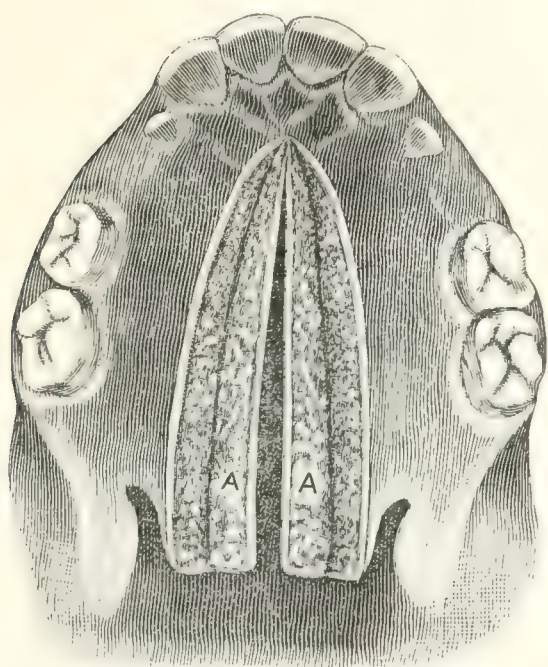


FIG. 7.

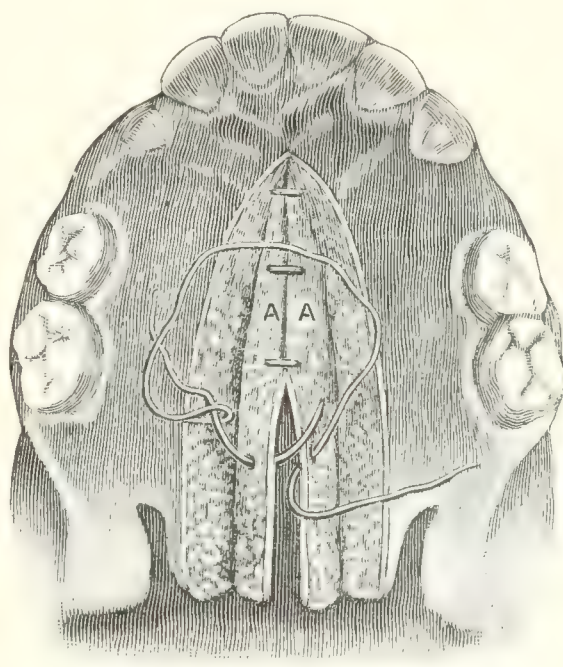


FIG. 6.—First step. A, A, flaps hinged by the mucous membrane on the nasal aspect.

FIG. 7.—Second step. A, A, flaps coapted by three sutures, and fourth one being inserted.

"3. *Second Row of Sutures.* Take the same needle and needle-holder and complete a row of interrupted stitches of horsehair on the buccal surface of the palate from the tip of the uvula forward, and tie them where apposition is possible without tension. The soft structures of the hard palate cannot usually be brought together until the next step of the operation is taken. (Fig. 8.)

"4. *Mucoperiosteal Flaps.* Place the forefinger of the left hand on the hamular process; take a short, strong, slightly curved, narrow-bladed knife, and make a curvilinear incision on one side, beginning just behind the hamular process, cutting down to the bone and extending forward along the alveolar process, as far as desired; prevent hemorrhage by pressure with the finger and gauze; rapidly raise the mucoperiosteal flap, with a strong periosteal elevator, from the segments of the hard palate, and immediately pack the wound firmly with iodoform gauze. Repeat this performance on the opposite side, and tie the

horsehair stitches not already secured. The soft structures of the hard and soft palate are beautifully held in apposition without tension on the stitches. (Fig. 9.)

"In packing the iodoform gauze in the wounds, fixation points are obtained by forcing some of it into the bone, and also between the teeth and under the mucous membrane. If this is properly carried out, the gauze will remain in place for a week, and sometimes longer. It is removed when it becomes loosened, by which time it has generally fulfilled its usefulness. A second and occasionally a third packing may have to be inserted.

"It will be observed that this is not a flap-splitting but a flap-formation operation, the flaps carrying with them two narrow strips of the

FIG. 8.

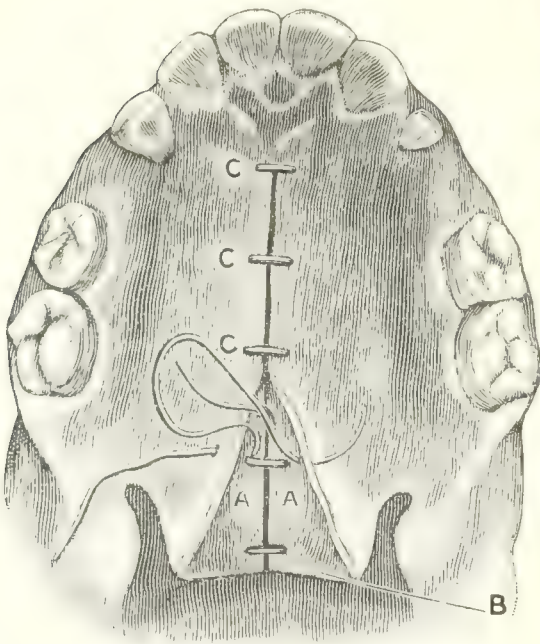


FIG. 9.

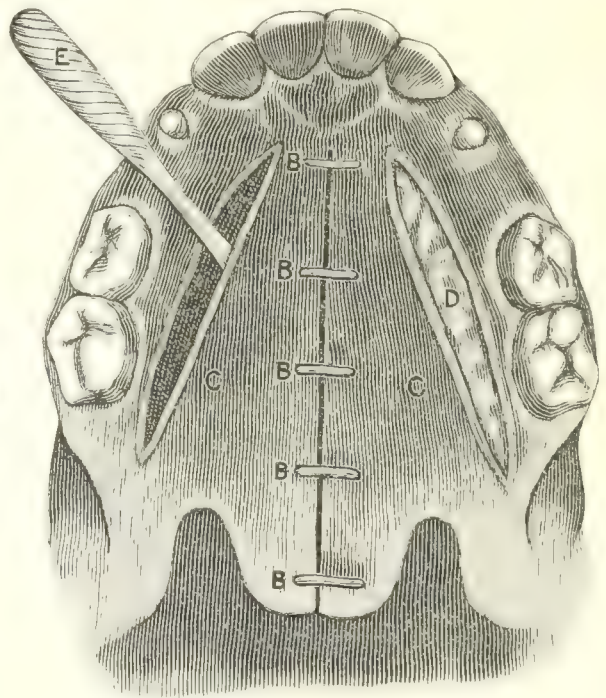


FIG. 8.—Third step. A, A, flaps inserted into nostril; B, last stitch first row; C, C, C, second row of sutures being inserted.

FIG. 9.—Fourth step. B, B, B, B, B, etc., second row of sutures; C, C, mucoperiosteal flaps; D, gauze packing; E, periosteal elevator; (a) the flaps and first row of sutures are no longer to be seen.

firm, strong, buccal mucous membrane of the palate, which holds sutures securely, and when they are turned upward and held in coaptation by means of the first row of sutures they form an ideal protecting roof to the raw surfaces beneath them, and afford twice the width of denuded tissues for apposition, and the nasal mucopurulent discharge is shed off to either side."

Regarding after-treatment, Ferguson says that every two or three hours the mouth should be washed with boric-acid solution, and after

the child has taken nourishment it should be given a little whiskey and water to wash the liquid food off the area operated upon. It is usually necessary to give nutritive enemata, and the stitches are not taken out earlier than the twelfth day. If the child cries much it will be necessary to give an opiate.

The following cases, he says, are suitable for this operation: 1. When the cleft in the hard palate is not wider than half an inch. If it is wider than half an inch, it will be necessary to first perform a preparatory crowding operation. 2. The mucous membrane should cover the inner edge of each bone segment, should be thick, and well nourished. If it is not, the crowding operation must be first performed. 3. The operation is adapted for all clefts of the soft palate alone. Ferguson maintains that the results of this method are vastly better than are obtained by any other. No tissue is removed, and very broad raw surfaces are brought together; and by the turning of the flaps upward the danger of sepsis is greatly lessened.

Salivary Glands. As is well known inflammation of the salivary glands may arise during the existence of or subsequent to an acute infectious fever, such as typhoid or diphtheria, and may also arise during stomatitis or pyæmia. In fact, it is probable that the inflammation which occasionally happens during acute infectious diseases is actually caused by stomatitis and putrefactive conditions within the mouth. Besides the above causes of inflammation of the salivary glands, we must remember the epidemic condition known as mumps. An inflamed salivary gland may suppurate, and when it does so there is always high fever and usually delirium.

Freudenthal¹ reports a marked case of paroxysmal swelling of the parotid glands. The patient was a female, aged thirty-two years, who for a number of years had been liable to be seized with attacks—most frequently on the left side—characterized by violent itching in front of the ear and by the onset of marked discoloration. In the earlier attacks there was no swelling, but after a time a swelling also occurred, and finally in each attack attained the dimensions of a goose-egg. The condition would pass away spontaneously in from ten minutes to half an hour, and there seemed to be no defect in the secretion of saliva or in the composition of this fluid. During two pregnancies that the woman had no attacks occurred, and yet previous to each pregnancy they had been occurring every day. The woman was anæmic and had had enlarged glands in childhood. The stomach was dilated and the heart was slightly hypertrophied. Her teeth were not good. Fever never took place during the existence of these attacks. Freudenthal

¹ Berliner klinische Wochenschrift, October 2, 1899.

looks upon the condition as hysterical. A very remarkable fact is that the husband of the woman had had several similar attacks. In such a case we would have to consider not only the hysterical condition, but angioneurotic oedema and the possibility of air having entered into a rigid salivary duct—a condition made familiar to us by Walther's reported cases.

Salivary Concretions. Salivary concretions are composed of carbonate and phosphate of lime. They may be purely of this composition, or these salts may be deposited about a foreign body as a nucleus. Salivary concretions usually arise because inflammatory conditions have roughened, thickened, or partly or entirely blocked a duct, and have likewise led to decomposition of the saliva. Some of the concretions are extremely small and are passed from the ducts; others are the size of a bean or even of an English walnut, and are retained. A concretion rarely permanently blocks a duct; it is apt, however, to block it from time to time. Large concretions, particularly if lodged in Wharton's duct, interfere notably with speech. A concretion can be palpated by placing one finger within the mouth and one finger externally.

Friedrich Henszel¹ has recently made a report on salivary calculus. In one of his cases a chronic inflammation of the submaxillary gland had caused thickening of the saliva and calculus formation, and the stone was first formed in the gland and later passed into the duct. In another case a bacterial inflammation seemed responsible for the formation of the calculus. In this latter case the stone formed in Wharton's duct. In the third case the author maintains that the stem of a pipe, by constantly injuring the sublingual gland, led to the production of the stone.

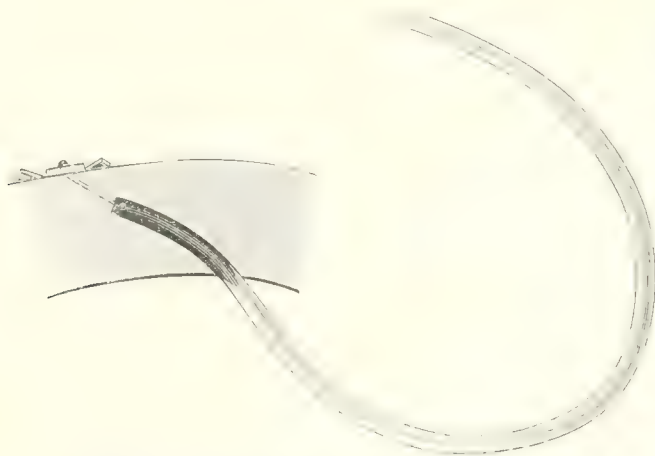
Salivary Fistula. A salivary fistula is a most annoying condition, and it is often extremely difficult to close it. Occasionally in operations in the parotid region Steno's duct is injured, and sometimes it is opened or partially destroyed by inflammatory conditions about the face. G. Frank Lydston² has devised and successfully performed a new operation for the cure of salivary fistula. The edges of the fistula were freshened, and a steel probe, eyed and sharply pointed, was threaded with a thick silk ligature, and passed downward and inward through the cheek into the mouth, the probe being made to traverse as nearly as possible Steno's duct, emerging at its orifice. The probe was taken out at the mouth, leaving the ligatures passing through the tissues of the cheek and emerging from the mouth. To the end of the ligature on the cheek was fastened a soft-rubber catheter (No. 12 F.). The catheter was

¹ Wiener klinische Wochenschrift, February 15, 1900.

² International Journal of Surgery, February, 1900.

drawn through the tissues of the cheek, thus replacing the ligature, and, like the ligature, passing out at the corner of the mouth. To the proximal end of the catheter a fine wire suture was fastened in such a manner that while it would suspend the catheter it would not occlude it; and the silver wire was twisted upon itself near the catheter, so that only a single strand of wire protruded. The catheter was drawn upon in such a manner that the cheek end was pulled into the tissues for half an inch, leaving only a strand of wire protruding from the fistula, and the fistula was sutured about the strand of wire with catgut, the wound was sealed with iodoform collodion, and the emerging silver wire was passed through several layers of iodoform gauze and finally through a lead plate, to which it was fastened. The free end of the catheter was fastened loosely with a piece of silk, extending from the eye of the catheter to the lead plate, in order to limit the movement of the instrument (Fig. 10.)

FIG. 10.



Operation for salivary fistula. (LYDSTON.)

The saliva readily escaped through the catheter and relieved all pressure toward the fistula, and not a drop of saliva escaped from the fistula after the operation. At the end of ten days the suspending wire was divided and the catheter and lead plate were removed.

This seems to be an extremely simple and very serviceable operation, and it must drain more satisfactorily than any of the other methods which have been employed. As Lydston points out, the operation is not suitable for some complicated cases, but is adapted to a simple parotid fistula.

Retropharyngeal Abscess. Retropharyngeal abscess may be tubercular or pyogenic—*i. e.*, may be a cold abscess or an acute abscess, although frequently, as a result of mixed infection, a tubercular abscess becomes inflammatory. Tubercular retropharyngeal abscess may arise as a result of tuberculosis of the bodies of the cervical vertebræ, or of tubercular disease of the upper, deep, lymphatic glands; and the

pyogenic abscess may arise as a result of pyogenic infection of the glands or of the periglandular tissues. Suppuration of these lymphatic glands may arise as a result of some infectious fever, such as diphtheria, typhoid or scarlet fever, as a result of injury, of otitis media, or of the absorption of pus from the nasopharynx. Occasionally glandular disease is due to syphilis.

A retropharyngeal abscess produces dyspnœa, dysphagia, great prostration, a nasal cry, and dribbling of saliva; frequently inclination of the head to one side, and occasionally convulsions or facial palsy. If a finger is introduced into the mouth a fluctuating swelling can be detected on the back or on one side of the wall of the pharynx, and if the mouth is opened and a reflector is employed this swelling will be seen to be of a yellowish color.

Spontaneous rupture rarely occurs in these cases. Johann and Bokay report spontaneous rupture in only nineteen out of 144 cases. The mortality of retropharyngeal abscess is estimated at from 6 to 10 per cent.

In treating these cases some surgeons maintain that it is proper to operate through the mouth. This can be done very easily and very rapidly, but, as pointed out by Walter Schmidt,¹ opening through the mouth has a number of serious disadvantages. If a large abscess is opened through the mouth the discharge may suffocate the patient, and after opening any abscess through the mouth septic pneumonia may arise from the inhalation of septic matter. Then, again, as Schmidt points out, if the abscess is tubercular the inhalation of tubercular material may lead to pulmonary tuberculosis; and after opening any abscess of this region through the mouth the swallowing of putrid matter may cause serious gastro-enteritis.

Schmidt, in the above-quoted paper, reports fifteen cases, two of them being tubercular. The thirteen non-tubercular cases occurred in young children, the oldest victim being but three years of age. Schmidt maintains that the best method of dealing with these abscesses is to make an incision at the anterior border of the sternocleidomastoid muscle, the abscess being entered to the outer side of the jugular vein and drainage being carried out by the use of several rubber drainage-tubes associated with packing with iodoform gauze.

Pharyngotomy and Tracheotomy. TRACHEOTOMY. Moure,² in discussing the technique of tracheotomy, maintains that the incision should not be made very high, on the ground that if a high incision is made much inflammation takes place below the glottis, the parts become thickened, and this thickening interferes with removal of the tube and

¹ Deutsche Zeitschrift für Chirurgie, March, 1900.

² Bulletin de l'Académie de Médecine (Paris), August 28, 1900.

antagonizes the restoration of normal breathing. He believes that our custom of beginning the incision at the cricoid cartilage is an error, and that we ought rather to start it at the second ring of the trachea.

There seems to be much force in Moure's contention. Nevertheless, it may be necessary to begin the incision as high as the cricoid cartilage in order to obtain enough room for safe work. In children and in short-necked people it is necessary to begin the cut high up. Tillaux says that as an average we can estimate the distance between the cricoid cartilage and sternum of an adult as two and three-quarter inches; of a child between three and five years of age, one and one-half inches; of a child between six and seven, two inches, and of a child between eight and ten, two and one-quarter inches.¹

Vallas,² in writing on the best method of removing growths from the pharynx or the base of the tongue, advocates a method of pharyngotomy preceded by median osteotomy of the hyoid bone. The same operation may be employed to remove foreign bodies and to operate on syphilitic contractions. The same incision permits of amputation of the tongue with ease. The operation is performed as follows:

The surgeon makes a vertical incision from the symphysis menti to the thyroid cartilage, dividing the skin and the subcutaneous tissue. The hyoid bone is then exposed, the superficial layer of the cervical fascia is cut, and the mylohyoid muscle is lifted in the median line, its upper border being divided from the hyoid bone in the median line; at this stage of the operation it will be necessary to tie one or two bloodvessels. The hyoid bone is resected in the median line by the use of bone forceps, and the two portions of the mylohyoid muscle are then separated.

The surgeon can now take one of two courses: he can go through the mucous membrane above, which separates him from the pharynx, or he can go through the thyrohyoid membrane below. After the completion of the operation it is not necessary to suture the hyoid bone; all that is required is to suture the muscle and the fibrous tissues. No functional impairment follows the operation. It is not necessary to perform preliminary tracheotomy unless the operation involves the larynx.

Vallas, in common with most operators, seems to assume it as an axiom that in operations involving the larynx direct preliminary tracheotomy ought to be performed. Dr. Keen's experience, however, has shown that the Trendelenburg position will prevent the entrance of blood and putrid material into the air passages during the operation, and render the performance of a preliminary tracheotomy unnecessary even if laryngectomy is to be performed.

¹ Treves' Manual of Operative Surgery.

² *Revue de Chirurgie*, May 10, 1900.

The custom in the hospital of the Jefferson Medical College is to do all operations about the jaws, mouth, tongue, trachea, etc., in this position. The avoidance of preliminary tracheotomy saves the patient the risk of a second operation, the wound of which is apt to become infected and saves the surgeon the time and trouble of performing it. I believe tracheotomy adds to the risk and does not diminish it.

Dr. B. Honsell¹ describes the operation of subhyoid pharyngotomy, which was originally devised by Malgaigne. He says that this operation has been performed four times in Bruns' clinic: once in order to remove artificial teeth which had been swallowed, once to extirpate a sarcoma of the pharynx, once to remove a cancer of the larynx, and once for the removal of an area of lupus from the larynx. Three of the patients recovered and one died. In Honsell's paper there is a statistical study comprising ninety-four cases gathered from literature. In all of Bruns' cases preliminary tracheotomy was employed. The writer says that among the ninety-four cases that he has gathered from the literature of the subject in which preliminary tracheotomy was not performed, the death-rate was 66 per cent., nearly all the deaths being due to aspiration pneumonia.

In Bruns' clinic after such an operation the stomach-tube is inserted and left in place for a week or two, and the patient is fed through the tube for this period. This has been done because of acquiescence in Kronlein's view that in cases of malignant disease the postponement of feeding by the mouth greatly endangers the patient. This operation finds its chief usefulness in the removal of foreign bodies embedded in the pharynx and which cannot be extracted through the mouth, and for the removal of malignant tumors of the epiglottis and pharynx. It was suggested by Trendelenburg that subhyoid pharyngotomy might be useful to afford drainage after extensive jaw resections.

Honsell estimates the mortality after this operation at 29 per cent., nearly half of the deaths being due to pneumonia, something over 10 per cent. to wound infections, and the rest to hemorrhage, exhaustion, and collapse.

It is the opinion of many surgeons that subhyoid pharyngotomy, though easy of performance and injuring no important vessel or nerve, does not afford sufficient room for the free and satisfactory use of instruments within the larynx.

Sir Felix Semon² points out the indications for the performance of thyrotomy, and thinks that it is a safe procedure. It is used to remove foreign bodies, to replace fragments after severe fractures

¹ Beiträge zur klinische Chirurgie, Band xxv., Heft 1. See abstract by Martin W. Ware, *Annals of Surgery*, March, 1900.

² *Lancet*, August 11, 1900.

of the larynx, for the extirpation of air-cysts of the larynx, in cases of laryngeal stenosis, occasionally in acute perichondritis of the larynx and in laryngeal tuberculosis. Semon has had successful results in laryngeal tuberculosis by performing thyrotomy, scraping away the ulcerated area, and cauterizing with lactic acid. One of his cases was well after three years. Thyrotomy has been successfully performed in laryngeal lupus. The operation may be performed for scleroma and for benign growths which cannot be removed by any intralaryngeal manipulation, but the most usual indication for thyrotomy is a malignant growth. The growth is removed, and with it a surrounding area of healthy tissue. This operation is justifiable only when the disease is purely intralaryngeal and when there is no involvement of the cervical lymph glands. Semon says that he has cured 83.3 per cent. of all the patients on whom he has performed thyrotomy.

It seems obvious that the operation should only be employed when intralaryngeal manipulation has failed or is obviously useless, because there is always the danger in thyrotomy that the vocal cords will be damaged and the voice permanently impaired.

Gersuny¹ describes a tracheotomy tube of funnel-shape which he has invented. He maintains that the large calibre permits of a much freer ingress and egress of air, and that the intratracheal end does not touch the mucous membrane; the wide part that is within the trachea completely fills it up, and therefore prevents blood or wound fluid from passing into the tube. The only disadvantage is that it is necessary to make a large opening in the trachea. The author claims that there is never pressure necrosis after using this tube. He says that the ordinary tracheotomy tube is objectionable, because, owing to the way in which it is bent, it requires a great deal of room in the trachea; and yet the actual calibre of the tube is small, and the end of the tube very often blocks against the mucous membrane, and pressure necrosis not infrequently arises in the soft parts.

Tubercular Glands of the Neck. Tuberculosis of the cervical lymphatic glands is a very common disease. In every community there are numbers of people who have enlarged glands, and also numbers who bear ragged and livid scars on the neck, marking the site of old glandular suppuration.

The disease is most common in children between the third and fifteenth years. It occasionally, although infrequently, occurs in infants, and is by no means rare in those considerably older than fifteen. In fact, it may not only be met with in middle life, but occasionally in old age—a condition often spoken of as senile tuberculosis. I have seen

¹ Wiener klinische Wochenschrift, June 28, 1900.

several instances of the disease in elderly people, an erroneous diagnosis having been made purely because of the age of the subjects.

The disease is occasionally secondary to some distant tubercular trouble, the bacilli having been carried in the blood and deposited in the glands, which had become, because of injury or inflammation, points of least resistance. In the majority of instances the infective material is carried in the lymph stream and is caught by the cervical glands, which filter the lymph as it is passing through them.

It is found clinically that the victims of this disease are usually of the type which used to be known as scrofulous—a term that is useful if employed to signify the possession of tissues inherently predisposed to tubercular invasion. In many cases of tubercular adenitis, but by no means in all, hereditary predisposition exists. The scrofulous are apt to suffer from catarrhal inflammations of the nose or throat, eczema of the scalp or face, granular conjunctivitis, chronic discharges from the ears, pimples and other eruptions of the skin, carious teeth, etc. Any one of these conditions may lead to ordinary inflammatory hypertrophy of the lymph glands; and in such a case, if the primary area of inflammation is cured, the gland will usually get well; but if the primary disease is not cured, after a time tubercle bacilli may reach the enlarged gland—occasionally in the blood, but usually in the lymph.

The inflamed glands are points of least resistance. The bacilli filter into the glands, and, if not destroyed, produce glandular tuberculosis. The enlargement of the glands is probably at first due to overaction, necessitated by the entrance into them of poison—possibly pyogenic cocci, possibly tubercle bacilli. The early enlargement is conservative, and often successful in destroying the poison, but if the gland is overstimulated and is so weakened that its powers flag, or if the bacilli are numerous and virulent, the living disease germs find lodgement and multiply.

We learn from the above facts that, even in the scrofulous, every enlarged gland is not tubercular, and that usually non-tubercular enlargement precedes the actual disease. The germs in the lymph are transported by the lymphocytes. In a healthy individual the lymphocytes not only embrace, but destroy the bacilli; but in the individual weakened by illness or predisposed by heredity the bacilli are not killed by the lymphocytes, and reach the glands alive. It used to be thought that bacilli could enter the lymph stream only from an actually tubercular lesion—*i. e.*, that a point of local tuberculosis had to be first established, and that tubercle bacilli would not be taken up from non-tubercular areas; but it is now thought that when the nasal or pharyngeal epithelium inflames and desquamates, or when the tonsils enlarge, the inflamed tissue may permit the organisms to pass the portals and

to be taken up by the lymphocytes, although no local lesion is produced.

Jessen¹ points out how enlargements of the glands at the angle of the jaw and along the sternocleidomastoid muscle are connected with disease of the tonsils, the pharynx, and the palate. He shows that in many cases in which glands are enlarged the removal of adenoid growths will be followed by shrinking of the glands, and that in many cases in which the glands are enlarged adenoids exist, although unsuspected. The remarkable fact is further pointed out that in some cases in which a cervical fistula has followed extirpation of glands and has refused to heal, the removal of adenoids will be followed by closure of the fistula. He maintains that in childhood the micro-organisms which cause swelling, and which in tuberculosis cause caseation of glands, enter through the pharyngeal or palatal tonsils, and occasionally through carious teeth; and that whenever enlarged glands exist adenoids should be sought for, and if found should be removed.

Inflammation and suppuration of lymphatic glands not unusually follow influenza, and influenza may likewise be followed by inflammation of the mucous membrane of the nose, throat, etc., and of the maxillary and frontal sinuses.² Glandular disease is particularly apt to arise in children after an attack of influenza.

The enlargement may quickly pass away—may suppurate—or some of the enlarged glands may shrink and others may remain permanently enlarged (Howard). Glands which remain enlarged may be purely tubercular. If an individual with tubercular glands gets influenza the glands are apt to quickly caseate or suppurate.

When a gland once becomes tubercular the disease runs the usual course of tubercle anywhere. The case may develop very slowly, may develop with considerable rapidity, may occasionally disappear, or may remain latent for years. Ordinarily, tubercular glands early in their development are freely movable, very slightly tender, and about the size of an English walnut. They enlarge and become matted to adjacent glands, but are not often painful. Although spontaneous disappearance occasionally occurs, it is very rare. After a time, in most cases, softening occurs; this is particularly apt to take place when the patient's general health is impaired. When the gland softens it becomes tender. In a person not at all predisposed to tubercle a single enlarged gland, when due to skin trouble or catarrh, will quickly disappear when the primary lesion is cured; but in a person strongly predisposed to tubercle the enlarged gland often refuses to disappear even when the primary lesion is cured.

¹ Centralblatt für innere Medizin, September 2, 1899.

² J. Warrington Haywood, in *Lancet*, July 1, 1899.

As a rule, tubercular glands are first detected in the neighborhood of the carotid bifurcation on one side. In considerably over half of the cases they are bilateral. The glands may be the only tubercular conditions that are obvious, but they may be associated with other tubercular diseases. The common seats in which they are met with are below the jaw, along the great vessels, and above the clavicle. They may pass down into the mediastinum, and in some instances may lead to phthisis or general tuberculosis. It is probable that phthisis is not very uncommon in these conditions. As a matter of fact, we often are unable to tell in a given case, when softening has not begun, whether we are dealing with tuberculosis or with inflammatory hypertrophy, and in such a case we ought carefully to examine the throat and nose, treat any diseased condition which is met with, improve the general health, administer tonics and nutritious diet, insist upon open-air exercise, and rub ichthyol into the enlarged glands daily.

Wheaton¹ emphasizes the important point that the lymph glands are engaged in a warfare to save the system from contamination. An increase in size means that the gland is antagonizing some pathological process, and the surgeon must not feel that it is always his duty to remove the gland merely because it is enlarged. He should feel reasonably sure that the glandular condition is not one which will disappear under medical treatment and is one due to tuberculosis. When he decides that tubercular glands really exist it is no use wasting valuable time in giving parenchymatous injections, but the glands should be extirpated promptly and radically.

Mr. W. Watson Cheyne² elaborately discusses the subject of tubercular lymphadenitis of the neck, and strongly advocates a thorough operation for tubercular glands. Cheyne does not see that there is any proof that glandular infection arises directly from dental caries, disease of the tonsil, or eczema; he thinks that the probability is that disease of the tonsil, of the teeth, etc., causes the glands to undergo acute inflammation, and that as a result of this glandular resisting power is lowered, and the infection takes place by deposition of bacilli in the glandular points of least resistance.

He says that if the glands remain small and hard it is useless to operate, because medical and hygienic means are usually sufficient to effect a cure. He points out that if there is persistent enlargement of many glands it is quite true that the condition may often exist for a good while without suppuration, but, nevertheless, the extirpation of the glands is advisable. It has been maintained by some surgeons

¹ St. Paul Medical Journal, September, 1900.

² British Medical Journal, December 16, 1899.

that when softening occurs it is better to incise and curette the glands than to extirpate them; but Cheyne strongly opposes this procedure, on the ground that it does not reach and remove smaller glands which are affected but not yet softened. He opposes it, further, because it does not remove all of the tubercular material, and the portion which remains infects the wound and may lead to recurrence. He employs curetting only when the gland has completely softened, and in such a case, after scraping it out, he injects the emulsion of iodoform and sutures the wound. He maintains that ulcers and fistulæ resulting from softening of a gland should be treated by excision and touching with pure carbolic acid.

Mr. Cheyne advises a most radical operation for the removal of enlarged glands due to tubercle. He acts just as the surgeon does who clears out the axilla in cases of cancer of the breast; he removes the glands and fat in a single piece, maintaining that there are numerous minute glands embedded in the fat, which glands are diseased and would be overlooked were the whole mass not taken out intact.

Cheyne points out that the chief danger of the operation is tearing the jugular vein; hence, this vein should be freely exposed at the lower part of the wound, below the enlarged glands. He begins to dissect from below upward, and, if necessary, he removes the vein with the mass, ligating and dividing the branches as he approaches them. He says that in practically every case in which caseation exists or in which suppuration is present he removes the vein with the glands.

He points out that there is no difficulty at all in preserving the descendens noni nerve, and that the spinal accessory nerve can be found by retracting the edge of the sternocleidomastoid muscle and partially separating it from its fascia to the point at which the nerve enters. The spinal accessory nerve usually passes through the glandular mass and divides it into two portions. When the nerve is found the glands which cover it are torn apart. In some few cases it is necessary to divide the sternocleidomastoid muscle in order to thoroughly expose the region of operation.

The operation advised by Mr. Cheyne is the most radical method which has yet been employed. In some cases it has seemed to us advisable to use the incision which was recommended a year or two ago by Charles N. Dowd, of New York. He uses an incision which is placed under the border of the inferior maxillary bone and is carried as far back as the mastoid process, and is then directed downward along the border of the hair, the latter having been shaved beforehand, and along the posterior margin of the sternocleidomastoid muscle. The flap, when dissected up, is turned forward, exposing the glands in front

of the muscle and back of it. This method gives admirable access to the wound and leaves a scar which is to some extent out of sight.

Resection of the Jugular Vein. As pointed out in the previous article, it may be advisable in tubercular glands of the neck to remove the jugular vein with the glands. Cheyne has advocated this method strongly, and has employed it also in some malignant tumors of the neck. In cases of malignant growth of the pharynx, tonsil, or pillars of the fauces in which there are enlarged glands in the neck and in which external pharyngotomy is performed it is often advisable to remove the jugular vein with the glandular mass. Thus the chance of effecting complete removal is greatly enhanced, and, further, septic clots, which are apt to form in the branches of the jugular vein after external pharyngotomy, are intercepted (Cheyne). I have removed the internal jugular vein in a case of lymphosarcoma of the neck, and also in a case of tubercular glands of the neck, without any trouble; in fact, it is remarkable in some of these neck tumors how many structures can be removed and the patient survive. I assisted Dr. Hearn in a case in which the internal jugular vein and the pneumogastric nerve of one side were divided, and Drs. Spicer and Collier have reported a case of sarcoma of the carotid sheath in which they removed the tumor, together with portions of the carotid arteries, internal jugular vein, and pneumogastric nerve, and yet the patient recovered.

C. Ewald¹ reports a case in which Albert resected the pharynx and tongue. During the operation it became necessary to tie the internal jugular vein on each side of the neck. It was found that there was an anastomosis between the internal and anterior jugular veins on one side. The patient had been in the semi-erect position during the operation. At its termination he was placed erect for a moment while the bandages were being applied, and he became cyanotic, but recovered. He was placed in a bed, the foot of which was elevated in order to prevent aspiration of secretions. In about half an hour he became blue. After a time the color became normal when his position was altered; but the heart became weaker and weaker, and he died in half an hour or more, in spite of energetic artificial respiration. He became very pale before he died; in fact, so pale that it was thought possible that there might be internal hemorrhage.

At the necropsy the dura was found to be extremely pale, and the great longitudinal sinus contained no blood; but the vena cava, portal system, and viscera contained quantities of blood. The heart was fatty and the brain was extremely oedematous. The fatal result was attributed to vasomotor trouble.

¹ Wiener klinische Rundschau, August 26, 1900.

It is a well-known fact that cyanosis is apt to occur after ligation of both internal jugular veins, but it usually disappears in a few days. While operating deep in the neck the jugular vein may be injured. A slight puncture or a tear may be closed by a lateral ligature. If there is a more extensive wound it may be sutured, and only when the wound is very extensive will it be necessary to ligate the vessel.

The carotid artery may be injured in a like manner, although this accident does not commonly happen. When such an injury occurs the rule has been to ligate the vessel, but recent observations would indicate that it is possible to suture it; for instance, F. Seggel¹ reports the case of a man who attempted to cut his throat. He inflicted a wound on the common carotid artery, oblique in direction and about 4 mm. in length. Seggel closed this wound with silk sutures which did not include the intima. It was necessary to apply six sutures. In this case the jugular vein, which was also wounded, was sutured. The patient recovered.

CHEST.

Hemorrhage from Penetrating Wounds of the Chest. Penetrating wounds of the chest are common and dangerous injuries. Important structures are damaged, the life of the patient is imperilled, and even if his life is saved he may suffer from the results of the injury for the balance of his days. Such injuries may be rapidly fatal, although occasionally very extensive injuries are recovered from. We can say of penetrating wounds of the chest as was said long ago of injuries of the head: that none is so slight as to be disregarded or so severe as to be despaired of. A person who has suffered from such a wound may die very rapidly, may die gradually, may perish as the result of some complication, may get partially well, or may completely recover.

We should always bear in mind the fact that a fractured rib may penetrate into the lung, and, further, that a penetrating wound of the chest, if low down, may involve the peritoneal cavity. In a penetrating wound the outer layer of the pleura may be pierced and the viscera not damaged. The lung may be injured, the pericardium damaged, the heart penetrated, or one of the great vessels may be entered.

The degree of danger, as J. D. Murfree² points out, "Is in proportion to the vitality of the parts injured, the extent of the wound, and the character of the substance inflicting the wound. Wounds of the

¹ *Münchener medizinische Wochenschrift*, August 14, 1900.

² *Medicine*, October, 1899.

heart and large bloodvessels are much more dangerous than wounds of the lungs, while wounds of the lungs are much more dangerous than wounds of the pleura and smaller bloodvessels."

Wounds entering the chest always cause hemorrhage, may cause pneumothorax, and may be followed by emphysema, pyothorax, or septicaemia. If pneumothorax arises there will be considerable collapse of the lung; and if this is extensive and sudden, as it is when the wound is large, it may produce death.

After the infliction of a penetrating wound of the chest, blood may or may not flow from the external wound. There is always some bleeding into the pleural sac. This bleeding may be trivial in amount, the blood being subsequently absorbed, but usually there is a severe, and often a very dangerous hemorrhage. The blood may come from an intercostal artery, from the internal mammary artery, from the heart, from a great vessel, from the lung, or from two or more of these sources. We can usually tell that a flow of blood is due to wounding of a vessel of the chest-wall by observing the situation of the penetration. As Le Conte¹ says, we cannot tell from the presence or absence of spurt-ing, because the ends of a divided intercostal artery and of a divided internal mammary artery retract so greatly that spurting does not occur. Hemorrhage from the internal mammary artery can be controlled by the tampon, but the ligature is preferable.

Le Conte² describes the method of tamponing as follows: "To tampon, the centre of a square piece of gauze is pushed through the wound and well filled with strips of gauze. The whole mass is then drawn forcibly outward and secured, so that firm pressure is made against the inner wall of the thorax and the two corresponding ribs. Occasionally an extension of the wound parallel with the ribs will permit of a ligation of the vessels, but if they have been completely divided their retraction will generally defeat this, and the wound must be enlarged in a direction parallel with the sternum, and a costal cartilage resected. This will give ready access to the artery. If the wound of the chest is below the third interspace the hemorrhage may be controlled with a strip of gauze firmly packed against the triangularis sterni muscle. The anastomosis of the internal mammary with the deep epigastric artery is so free that both ends of the vessel must be secured or hemorrhage from the distal portion will take place."

In the above-quoted article Le Conte shows that each intercostal artery at the angle of the ribs divides into two branches, the smaller branch running along the upper border of the rib below and the larger branch running in a groove along the lower border of the rib above. The

¹ Philadelphia Medical Journal, April 14, 1900

² Ibid.

smaller branch is of such insignificant size that it never gives rise to severe hemorrhage when divided.

The same author points out that penetration posterior to the angle of the ribs almost certainly divides the intercostal artery. In this region the vessel can be exposed by enlarging the wound, and a ligature can then be easily applied, the surgeon taking care, in the words of Le Conte, "to avoid further wounding of the pleura." If the wound is anterior to the angle of the ribs the artery "in this situation is well protected by the groove in the rib, and will seldom be injured unless the rib itself shows marks of violence" (Le Conte).

Le Conte says that we can ligate the vessel by simply enlarging the wound. The ends of the vessel retract so much, however, that they are sometimes difficult to find, and I believe it is better in these cases to resect a portion of the rib before endeavoring to tie the vessel. It makes the subsequent ligation easier, quicker, and more certain.

If in spite of the arrest of bleeding in the chest-wall, or if when there has been no bleeding in the chest-wall, there are symptoms of hemorrhage and signs that blood is accumulating within the pleural sac as a result of lung injury, what is to be done? If the bleeding is associated with pneumothorax several ribs should be resected, and Verneuil¹ maintains that the lung should be exposed and sutured, and then a drainage-tube should be introduced. (We would call particular attention to the very valuable and thorough paper by M. H. Verneuil. This paper was read before the Société Belge de Chirurgie, and the paper and the debate upon it will be found admirably abstracted by Dr. Alex. Miles in the *Scottish Medical and Surgical Journal*, October, 1900. We have quoted this abstract extensively.) Other surgeons would simply introduce a drainage-tube without suturing the lung. It is true that when a bronchus has been opened and pneumothorax has arisen, the mixture of the air with the blood and the collapse of the lung usually arrest hemorrhage; but infection is very apt to take place, and the patient's life will be placed in great jeopardy if drainage is not established.

If pneumothorax does not exist after one of these injuries the question of how to act becomes more difficult. Some cases appear practically moribund for hours and yet recover without operation (Verneuil), and in such a case the shock of an operation might have turned the trembling scale and caused death; but, as Verneuil says, if bleeding continues operation gives the only chance for life, and it must be performed. It should, however, be performed only when there is positive ground for the belief that a dangerous hemorrhage exists and is continuing.²

¹ Annales de la Société Belge de Chirurgie, June, 1900.

² Ibid.

The method of treatment in hemorrhage after a penetrating wound of the chest which was long employed and still has some advocates is to cleanse and close the external wound, to apply dressings, and to immobilize the chest. Murfree,¹ in a previously quoted article, advocates cleansing and suturing the wound, dressing antiseptically, applying a bandage and a plaster-of-Paris jacket, or else applying cold after tightly bandaging. He places the patient on the injured side, keeps him quiet, and gives opium.

Verneuil² believes that closing the wound in the pleura, either by plugging or by suturing, is useless.

Le Conte³ discusses in a very practical manner the value of closing or plugging the external wound. He says that mechanically the thorax may be looked upon as the framework of a pair of bellows, and the lung as an elastic bag within the frame, this elastic bag having no connection with the outer air except through the nozzle of the bellows—that is, the trachea. When muscular effort enlarges the framework, atmospheric pressure forces air into the lungs and distends them so as to make them fill up the space caused by the distention of the framework. No muscular effort is necessary to carry out quiet expiration, as this is accomplished purely by the elasticity of the parts, the most powerful force being the elasticity of the lungs themselves.

When this framework is perforated, if the chest is expanded, air enters through the perforation as well as through the trachea. The amount of air which passes into the pleural cavity will be in proportion to the size of the opening in the chest-wall, and the more air that enters through the unnatural opening, the less enters through the trachea. If the perforation is equal in capacity to the windpipe the lung will collapse completely, because it is easier for air to enter through the perforation than for it to enter the trachea and overcome the elastic resistance of the lungs.

Le Conte goes on to point out that the surgeons who advocate plugging or suturing the external wound usually strap the chest, apply cold, and give drugs like ergot and sulphuric acid. The object aimed at in closing the wound is to dam up the blood within the pleural cavity, believing that it will make mechanical pressure upon the lung and stop hemorrhage. Le Conte freely admits that many cases have recovered under this treatment, but he does not think that the hemorrhage is arrested by intrapleural pressure produced by gathering blood. This, obviously, could not be unless the amount of blood lost was enormous. Le Conte shows that the pressure in a lung on forced inspiration equals

¹ *Medicine*, October, 1899.

² *Annales de la Société Belge de Chirurgie*, June, 1900.

³ *Philadelphia Medical Journal*, April 14, 1900.

a column of mercury 30 mm. high, and that at expiration there is a negative pressure of from 6 to 10 mm. of mercury—that is to say, there is a tendency on the part of the elastic tissue of the lung to still further contract which is equivalent to from 6 to 10 mm.

It is supposed by the advocates of strapping the chest that it will keep the lung in the expiratory position, and that in this position intrapleural pressure is negative instead of positive. As Le Conte says, it is quite true that the capacity of the chest is lessened, but it will still hold a quart or two of blood before any considerable pressure will be exerted upon the lung.

The same author continues the discussion of the subject in these terms : “Secondly, when blood is poured into the pleura and air is excluded there is little or no tendency for it to clot, and it frequently remains fluid for days or even weeks. Therefore, the chances of the cut vessels closing by clot are materially decreased. Thirdly, as the mechanical pressure from the effused blood increases and forces the lung back against its root it must materially affect the circulation of blood through the lung, and so engorge the right side of the heart and raise the blood-pressure. Therefore, as the mechanical pressure increases the blood-pressure rises also, and, the severed vessels remaining patulous, the gain from the outside pressure is in a measure overcome by the increased pressure within the vessels. I say in a measure, for the loss of blood will, of course, tend to decrease the blood-pressure. By the application of ice to the chest only a slight effect can be exerted on the lung, and the exhibition of drugs I believe to be useless, and of ergot to be positively harmful. Ergot stimulates the muscular fibres of an artery to contract, and so diminishes the calibre of the tube; but at the same time it makes the artery more rigid and prevents its walls from collapsing, and therefore lessens its chances of closing by clot. Now when such a case recovers it does so with a pleura filled with blood. If the blood remains fluid it may be easily aspirated, and no harm result; but if clotting takes place a rather formidable operation would be required to remove the clots, and if they are allowed to remain organization will take place, the pleural cavity will be obliterated, and the lung tightly glued to the chest-wall—a condition which certainly impairs the usefulness of that organ and renders it more vulnerable to disease.”

Le Conte strongly and ably advocates treating serious cases of hemorrhage in the pleural sac due to wounding of the lung by introducing a tube and admitting air into the sac. He says : “When a drainage-tube is inserted into the pleural cavity and free drainage established the pleura is rapidly filled with air and the muscles of respiration are prevented from acting on the lung, allowing the lung to contract by its own elastic tissue as well as by the pressure exerted by the pneumothorax, and at

the same time the presence of air favors clotting in the severed vessels. In my limited experience this simple procedure has been quite sufficient to control very alarming hemorrhage. In addition the drainage has cleared the pleura of blood, and if any infecting material has been carried in it has reduced its dangers to a minimum. It has been objected that the drainage-tube is itself a menace to the sterility of the wound, but if the surgeon has taken proper precautions to protect it the dangers of infection from this source must surely be slight. However, if it does occur it will be limited to the immediate neighborhood of the wound and cannot be a complication of much seriousness. Another objection, and one of more weight, is the danger to the patient from a large and rapidly formed pneumothorax. Many experiments have been made on dogs to find out what these dangers are, and they have shown that when a healthy pleura (one without adhesions) is freely opened, symptoms of heart-failure are rapid, labored breathing is always present and very alarming, and in several instances was sufficient to cause the death of the dog. If the animal did not die the dangerous symptoms slowly disappeared. If the wound was promptly closed the symptoms disappeared much more rapidly. The gravity of these symptoms was directly dependent upon the size of the opening made in the chest and the rapidity with which a complete pneumothorax was formed. Death was undoubtedly due to the sudden engorgement of the right side of the heart, and the dog lost his life because he was strong and full-blooded, and the sudden rise in blood-pressure was sufficient to overcome the heart. Would these objections seriously apply in a man who has lost much blood? I think not, but if dangerous symptoms do appear, withdraw the drainage-tube and temporarily close the wound with gauze. In a short time these dangerous symptoms will disappear, and you can then insert a smaller tube and allow the pneumothorax to form more slowly. The admission of air to the pleura is perfectly under your control, and you can stop it, increase it, or diminish it at will. Further, when the hemorrhage has been very great and the blood-pressure reduced to its lowest ebb the free opening of the pleura is a quick and ready means of raising the pressure and tiding the case over until sterile salt solution can be injected into a vein."

Terrier¹ is a believer in the same plan, and advocates pleurotomy and drainage to arrest hemorrhage and prevent infection. We thoroughly agree with the conclusions of Terrier and Le Conte.

If the insertion of a tube fails, and the patient becomes worse and worse, what is to be done? Something radical must be done or the patient will quickly die. We should combat shock by all the accepted

¹ *Annales de la Société Belge de Chirurgie*, June, 1900.

methods—raising the foot of the bed, giving an enema of hot salt solution and throwing salt solution into a vein, administering hypodermatic injections of strychnine, bandaging the extremities if it is thought advisable, wrapping the patient in hot blankets and surrounding him with hot bottles.

Some cases may be so far gone that it is considered best to perform the operation under a local anæsthetic, the surgeon injecting Schleich's solution or eucaine into the region which he proposes to incise. In many cases, however, a general anæsthetic may be given. Some recommend bromide of ethyl, others apply chloroform; but in the weakened condition of the patient I think that ether is preferable, as it is not so depressing to the circulation as are the other two agents.

A flap should be cut from the soft parts on the wall of the chest, portions of several ribs should be quickly resected, the lung should be exposed, and the wound in the lung should be sutured, or, if possible, should be packed with gauze. In some cases, however, this is impossible; for instance, in a case of secondary hemorrhage occurring a number of days after a gunshot wound of the lung I operated and found the lower lobe of the lung in a sloughing condition and bleeding furiously from numerous points. In this case the pleural cavity about the lung was filled with sterile gauze, in order to hold the organ firm and give a base of support. This preliminary packing was followed by carrying iodoform gauze down upon the bleeding surface and making compression. The hemorrhage was completely arrested. After the lung has been sutured or after a wound in the lung has been packed with gauze the drainage-tube should be retained for a number of days in the pleural cavity.

Bullet Wounds. The wound inflicted by the bullet of a small-bore modern rifle may cause very trivial hemorrhage. In the Spanish-American War and in the South African War it was noticed that a Mauser bullet might pass completely through a lung and yet inaugurate very little bleeding. Many such cases recovered practically without symptoms after closing the wound and immobilizing the chest. In a certain number of cases empyema followed. A revolver bullet or the old-time rifle bullet usually produces a more serious condition.

Michel Christovitch¹ reports a case of injury by a revolver bullet which illustrates this point: A young man, while engaged in a quarrel, was shot with a revolver, the bullet entering the third left intercostal space. When first seen by the surgeon he was extremely pallid from hemorrhage. No wound of exit was detected. The wound of entrance was at once closed by an antiseptic dressing. The patient was given

¹ *Revue de Chirurgie*, August, 1900.

small amounts of morphine, stimulants were administered, and ice was applied to the chest. His condition remained most serious, and on the sixth day became very threatening, it seeming as if death from suffocation was about to ensue. An exploratory puncture was made in the seventh intercostal space, and a mixture of pus and blood flowed out. A portion of the sixth rib was then resected, and the bullet was detected with the finger, it being lodged within the lung. A flap was raised from over the lung, the pulmonary structure was incised, the bullet was removed, and with it some portions of gangrenous lung. The hemorrhage was arrested by packing with gauze, and drainage-tubes were inserted into the pleural cavity. This patient left the hospital cured two months after the accident.

The above case is a favorable one. Very many similar cases of injury perish. There can be no doubt that the bullet of the Mauser, the Lee-Netford, or any other small-bore rifle usually inflicts much less damage when it passes through the chest than does a pistol bullet or any other projectile. These facts are indicated in the *Annual Report of the Surgeon-General of the U. S. Army for the Years 1898-99*. He shows that the proportion of men killed in battle was much larger during the Civil War than it is now, and points out that the same tendency is shown when we exclude from consideration the killed and consider only the wounded who were cared for by the surgeons. Of this group of patients 6 per cent. died in the Spanish-American War; in the Civil War 14.3 per cent. died. The very greatly reduced ratio between the killed and the wounded is due to the nature of the bullet, but the diminished mortality among hospital cases is due partly to the nature of the bullet and partly to improved methods. During the Civil War 62.6 per cent. of the cases of penetrating wounds of the chest died; during the years 1898-99, 27.8 per cent. died. During the Civil War there were 8403 cases noted and described, and 6260 of them died; during the years 1898-99 there were 198 cases and 55 deaths. A *résumé* of the Surgeon-General's report will be found in the *Journal of the American Medical Association*, November 17, 1900.

A number of extremely interesting cases of gunshot wounds of the chest have been reported from the seat of hostilities in South Africa; for instance, an article on the "Medical Aspects of the War, by a South African Campaigner,"¹ reports the following case: A man, while in the prone position, was shot, the bullet entering near the outer third of the left clavicle and emerging posteriorly on the right side, between the twelfth rib and the crest of the ilium and two and one-half inches away from the spine. This bullet must have traversed the thorax and a part

¹ British Medical Journal, April 21, 1900.

of the abdomen, and yet this case, in common with many others shot through the chest, had very trivial symptoms, only pleuritic pain and slight hæmoptysis.

Sir William MacCormac called attention in the *Lancet* to a number of interesting cases of this sort, and the special correspondent of the *Medical Record* (April 7, 1900) describes these cases as follows: In one case a bullet perforated the sternum at the junction of the manubrium and gladiolus, and emerged near the humero-thoracic junction of the right side posteriorly. The patient spat up a little blood, but the wound healed without any evidence of lung trouble.

In another case a shrapnel bullet entered the chest an inch below the line of the left shoulder-blade and was felt beneath the skin just to the right of the xiphoid cartilage. In this case there was slight spitting of blood, but no other evidence of lung injury.

In a third case the bullet entered below the outer extremity of the right clavicle and emerged a little to the left of the spine of the fifth dorsal vertebra. There was some cough, some dyspnœa, and a little spitting of blood, but the patient quickly became convalescent.

In a fourth case the bullet entered the fifth right intercostal space near the sternum, and emerged below the twelfth rib of the right side, two and a half inches from the middle of the spine. In this case there was some trivial hæmaturia, but the patient recovered without any other symptom.

In the fifth case a bullet passed through the left arm posteriorly, entered the chest a little internal to the left nipple, and emerged to the right of the middle line at the level of the spine of the sixth cervical vertebra, after passing through the trapezius muscle. This patient expectorated a little blood for a short time, but got well without any other symptoms.

In the last case the bullet entered the chest in the eighth intercostal space of the right side in the mid-axillary line and emerged a little above and a little posterior to the anterior-superior spine of the ilium of the left side. The patient vomited, but presented no other symptom.

The *Medical Record* says that in the above-quoted cases most serious injuries must have occurred—injuries which until very recently surgeons would have looked upon as fatal—and yet the patients recovered. In the last case the bullet must have passed through the liver and probably also through the intestine. In the case before the last it is wonderful that the large vessels escaped, as the lung was certainly wounded; in the fourth case the kidney was certainly injured. The correspondent of the *Medical Record* concludes that perforating wounds of the skull, abdomen, and thorax made with a Mauser bullet “appear to have no particular terrors.”

Major William Dick¹ furnishes notes on some cases of gunshot wounds from South Africa. In one case the bullet had entered behind the middle of the posterior border of the left scapula and had emerged one and one-half inches below the middle of the left clavicle. The patient had expectorated a little blood, but had had no other symptoms, and subsequently was cured and returned to duty. Another case was almost identical.

In a third case the bullet had passed through the middle of the breast-bone and had emerged in the eleventh intercostal space. In this case there had been dyspnœa and hæmoptysis, and hæmothorax had developed. It was found necessary to incise the chest because of the hæmothorax, but this patient completely recovered.

In another case a bullet had entered about the middle of the sternum, had emerged in the left axilla, had then entered the inside of the arm and emerged behind the left elbow-joint. It was stated that the left pleura had been aspirated. The man arrived home perfectly recovered. Major Dick then goes on to report various other cases which passed through the Netley Hospital after returning from South Africa, all going to confirm the statements as to the comparative harmlessness of the Mauser bullet.

A. R. J. Douglas² reports four cases of bullet wounds of the chest. He shows how important it is in all these cases to decide whether the chest is penetrated or not, and if the wound is penetrating, what is the injury to the thoracic contents. He says that in forming a judgment upon these points it is important to know with what weapon the injury was inflicted. In one of these cases the symptoms of injury were shock, dyspnœa, and spitting of bloody sputum; but all of these signs can occur with non-penetrating wounds of the chest. It is a well-known fact that hæmoptysis can occur when the lung has not been injured, and Douglas quotes Fraser to the effect that in the Crimea, out of nine fatal cases of gunshot wounds of the lung only one spat up blood, and that in seven cases in which no lung injury was found two spat up blood. There is also a case published in the *Transactions of the Pathological Society* in which the base of the right lung was perforated, and yet there had been no hæmoptysis.

Douglas would explain the existence of hæmoptysis in non-penetrating wounds of the chest by the rupturing of small pulmonary vessels or small lacerations of the visceral pleura caused by contusion. He says that hæmoptysis alone is of but little value as a sign of the injury, but that considered in conjunction with the situation of the wound and the direction of the bullet it does have some bearing. In some of these

¹ British Medical Journal, February 24, 1900.

² Ibid., October 21, 1899.

cases reported by Douglas after undoubted gunshot wounds of the chest the bullet could not be discovered by the X-rays. In one of the reported cases hæmothorax arose. The patient was aspirated on three occasions and gradually recovered. Douglas says that in most cases of hæmothorax due to gunshot wounds the hemorrhage is primary, and is a common immediate cause of death; but in a few cases, as in Case IV. of this list, the hemorrhage is secondary and occurs some days after the injury. A similar case was reported by Mr. Herbert Page.¹

The ultimate fate of bullets in the lung is a matter of considerable importance. Douglas says that his examination of the literature indicates that in a few cases the bullets may remain encysted in the chest-wall for years, inside of the chest, or even in the lung, or—as was the case in one well-known instance—in the wall of the heart. In some of these cases the bullet never gives rise to trouble; in others it produces chest symptoms of a vague character, and in others it leads to the formation of an abscess; but, as a rule, sooner or later an embedded bullet will set up an irritation and lead to an abscess formation, and either spontaneously make its way out of the chest-wall or be expectorated or establish a condition which makes operation imperative. The author quotes a case reported in the *Lancet* for 1847, in which a ball remained lodged in the chest for fifty years and was found after death. It had caused considerable trouble to the patient during his life. Douglas also mentions cases reported in the *Medical and Surgical Reporter of Philadelphia*, in which bullets were expectorated after seven weeks and after three years. The four cases above quoted were in Mr. Butlin's ward, and were under Douglas' care as house surgeon.

In considering the proper procedure when a bullet is lodged in the chest Verneuil² says that it may be necessary to operate because of hemorrhage or because of pneumothorax, but the bullet is not searched for at the time of this emergency operation. If necessary it can be removed later in order to bring about the cure of an infection or to prevent infection.

Tubercular Pneumothorax. John Lovett Morse³ maintains that from 70 to 85 per cent. of all cases of pneumothorax are tubercular. He says that if a case is not due to tubercle and is due to trauma the prognosis is good; that in pneumothorax arising secondarily to pulmonary abscess the prognosis is fair, and that excision of ribs in these cases is distinctly encouraging as an operative procedure. He shows that tubercular pneumothorax is more common in males than in females; occurs particularly between the ages of twenty and thirty years, and is

¹ *Lancet*, 1877.

² *Annales de la Société Belge de Chirurgie*, June, 1900.

³ *American Journal of the Medical Sciences*, May, 1900.

more often found on the left side than on the right. In most cases it comes on gradually, but in some it arises suddenly, and the most common symptom first observed is severe pain associated with dyspnoea. The patient may not be thought to have tuberculosis, and pneumothorax may be the first symptom of tubercular disease to appear.

It is an interesting and remarkable fact noted by many observers that when pneumothorax develops during the course of pulmonary tuberculosis the tubercular process may be arrested or even cured. Henry P. Loomis (September 29, 1900) refers to the report of Dr. W. F. Hamilton on six cases of pneumothorax occurring during the progress of pulmonary tuberculosis. Two died soon after the beginning of the pneumothorax, one lived seven months, and three recovered.

When pneumothorax does occur the heart is always displaced. Morse shows that pure pneumothorax is a rare affection, because there is usually fluid present, as well as air; in fact, if the patient lives over a week fluid is certain to be present and is almost invariably purulent.

Morse says that about 15 per cent. of these cases may be expected to recover; but these are the cases in which there is a serous effusion, and even these generally die later from pulmonary tuberculosis. He maintains that right-sided pneumothorax gives a worse prognosis than does left-sided pneumothorax, and he thinks that in purulent cases we should at least consider the advisability of surgical interference.

Drasche¹ advocates operation in certain cases of tubercular pneumothorax. He has treated 198 cases of this condition, and in 24 of these he has employed puncture, sometimes with aspiration. In one case he also resected a portion of a rib. In a recent case of pneumothorax without threatening symptoms he uses purely expectant treatment, but should threatening symptoms arise he employs puncture if he thinks that the lung is able to expand.

The points which determine whether the operation should be done or not are the condition of the patient and the stage to which the phthisis has advanced. Of course, if the cavity in the lung is large we cannot anticipate a cure. Four of the twenty-nine cases were completely cured, and even those not cured lived longer than those treated expectantly. Two of the cured cases had likewise had effusion, and it was necessary to drain for a considerable time; in fact, it is in cases of pneumothorax with effusion that the best results follow aspiration. We puncture for pain, dyspnoea, and cyanosis, and if these symptoms are not quickly relieved by puncture the patient will probably die. It may be necessary to make several or many punctures.

Before performing the operation Drasche gives a hypodermatic injec-

¹ Wien. med. Blatter, October 19, 1899

tion of morphine to prevent irritation of the pleura during the operation. He uses a small trocar and not a large one, because he thinks it advisable to slowly lower the intrapleural pressure, and he does not completely remove the air.

Many physicians have opposed operation in pneumothorax. It is certain that in a young person suffering from rapidly advancing phthisis operation should not be performed. It is sure to fail, and may accelerate death. In an older subject, in which the phthisis is not rapidly advancing, operation may do great good; in fact, as shown in the above-quoted article, in such cases operation will often relieve the symptoms and may actually cure the case. In pyopneumothorax operation is imperatively demanded. In some cases of pneumothorax, as previously stated, the tubercular process in the lung is retarded or possibly cured. I agree with West's views, which are as follows: In an early case wait a while and do not operate unless the symptoms grow worse. If we must do something, do not at once incise. In the early stage incision is dangerous, and we should use puncture, employing a trocar, applying no suction, and repeating if necessary. If tapping relieves the urgent symptoms wait a while before doing anything else surgical. If puncture fails to relieve, incise. Repeated tapping may sometimes cure hydropneumothorax, but incision will probably be required. If pyopneumothorax arises perform thoracotomy.

Foreign Bodies in the Lung. We have already made some remarks upon bullets lodged in the lung. Foreign bodies not infrequently are lodged in the bronchi, and the majority of such bodies are capable of detection by the X-ray. Verneuil¹ says that a foreign body in a bronchus may cause ulceration and gangrene and demands pleurotomy and pneumotomy.

E. Gulikers² reports the case of a man who thought that he had swallowed the metal tip of a pencil. On examination it was believed possible that the metal pencil-tip might have passed into the air passages, and a skiagraph was taken, which demonstrated it at the level of the eighth rib. The foreign body seemed to cause no trouble, except a certain amount of morning cough and expectoration. For eight days he was kept in a position with the head lower than the body, and at the termination of this period he distinctly felt the foreign body pass into his throat. He was then told to rest himself upon his arms, take a slow, deep inspiration, and utter a base note, in order to open his vocal cords. He succeeded in expelling the foreign body without coughing.

The same author reports the case of a child who had inhaled a metal

¹ *Annales de la Société Belge de Chirurgie*, June, 1900.

² *Annales de la Med. Chi. Soc. de Liege*, June, 1900.

arrow which was part of a toy. It remained in the bronchus for six months, and was then expelled during vomiting. During these six months the patient had had attacks of pleurisy, spitting of blood, and a very persistent cough.

Andrew V. Jova¹ reports the case of a young man who had had a tack in the lung for seven years. At the end of this time he coughed it up. It was seven-eighths of an inch in length and was covered with rust. The idea that he had inhaled a foreign body into the lung had been ridiculed by various physicians, who supposed that he was laboring under chronic bronchitis.

H. T. S. Bell² reports a case in which the right bronchus was obstructed by a small, circular dress button. The patient was a child, aged seven years, who three days before admission had been seized with violent coughing and choking, and was in the same condition on admission. During the first few days the child was very restless, coughed a great deal, complained of choking sensations, and brought up quantities of frothy sputum, which was sometimes blood-stained, and during the attacks of coughing cyanosis sometimes occurred. Seventeen days after admission the right side of the chest was dull on percussion; there was bronchial breathing at the right apex, and the breath sounds at the base were distinct. The right side was explored with a needle, and no fluid was found. At this period the child stated that she thought her trouble was due to a button that she had swallowed some months before admission, but her mother did not believe her story. The patient gradually improved, but about a month after this time, while walking in the ward, she suddenly became cyanotic and died in about five minutes. The post-mortem showed that the pleura was adherent over the right lung, that the right lung was solid, and that the right bronchus was considerably dilated from the tracheal bifurcation to the beginning of the bronchial branches. There was some slight superficial ulceration in the mucous membrane, and a small dress-button was found in the left bronchus.

E. W. Row³ reports a case in which a coffee-grain was lodged in the bronchus for two months. The patient was a girl, aged twenty-one months, who was supposed to have some condition like membranous croup. Dr. Holladay performed tracheotomy, introduced the tube, and practised artificial respiration, and the child was restored to a good condition. The mother insisted that this cough had been produced by swallowing a grain of coffee. The next afternoon the breathing became oppressive and interrupted. The tube was removed to seek for the

¹ Medical Record, October 7, 1899.

² Australasian Medical Gazette, December 20, 1899.

³ Virginia Medical Semi-Monthly, December 22, 1899.

cause, and a small grain of coffee was coughed up. The tube was not replaced and the wound was closed.

G. W. Armstrong¹ reports the case of a child, aged eighteen months, who sucked a melon-seed into the left bronchus. It remained in the bronchus for over nine months, at which period a tracheotomy was performed, and the seed was almost at once expelled. The trachea was immediately closed after the expulsion of the seed.

As we previously stated, a foreign body can generally be recognized by the X-rays, but sometimes it cannot. Dr. A. Coolidge, Jr.,² suggests a method for determining the position of a foreign body and also for removing it. He says that it has been pointed out by Schroetter that if a straight speculum be passed into the trachea, and the upper part of the body and the head be bent backward and toward one side, the speculum may be pushed so far downward that its axis is identical with the axis of the lower part of the trachea; the right bronchus can then be seen, and also a considerable portion of the left bronchus. Coolidge reports the case of a man, aged twenty-three years, who had had a tracheotomy performed twenty years before for laryngeal stenosis, and had worn a tube all that time. A portion of the hard-rubber tube became separated and was inhaled into the bronchus, and it could not be located by the X-rays. The patient was anaesthetized and placed supine, his shoulders projecting beyond the end of the table. The head was turned backward and a little to one side. The tracheal opening was somewhat enlarged toward the sternum. A urethroscope was inserted through the tracheal wound, the stylet was taken out, and the tube was passed down the trachea almost to the bifurcation. A forehead mirror then showed the parts perfectly. The foreign body was lodged in the right bronchus a little below the bifurcation, and it was seized with forceps and removed. During these manipulations the patient breathed easily through the speculum, although occasionally there was cough.

Surgical Aspects of Pneumonia. Lobar pneumonia occasionally, though rarely, occurs soon after a surgical operation. Some have thought that it might be produced by the anaesthetic; others, that it might be due to the employment of an infected inhaler. Not unusually when it occurs it seems to be caused by a sudden change of temperature from a very warm operating-room to a very cold hall, recovery-room, or ward.

A. Pearce Gould,³ in an article on the "Surgical Aspects of Pneumonia," thinks that there is no proof that pneumonia is ever caused

¹ Australasian Medical Journal, September 20, 1899.

² New York Medical Journal, September 30, 1899.

³ Practitioner, February, 1900.

by the use of a dirty inhaler. He says that great exposure of the patient's chest during the operation is another alleged cause. Exposure may be followed by bronchitis or bronchopneumonia, and should always be carefully guarded against.

Gould points out that it may be that a surgical operation is performed just as an attack of pneumonia is developing, and he reports an instance related to him by Mr. G. H. Bailey, who had been asked to administer the anæsthetic for a breast operation, and, observing that the patient's breathing was very rapid and somewhat difficult, examined the chest and discovered extensive pneumonia of the lower lobe of one lung.

A year ago I had an exactly similar case, with Dr. Edwin E. Graham. We went to the patient's house to perform an operation for cancer of the breast. The woman did not complain of pain, and the nurse had neglected to take the morning temperature. Dr. Graham noticed the dusky appearance of the face and the rapid respiration, and on examining the chest found the entire lower lobe of the right lung consolidated. The idea of operating was, of course, at once abandoned, and the woman died in a few days. If the operation had been attempted death would most probably have ensued quickly.

As Gould points out in the above-mentioned article, bronchopneumonia is much more common after surgical operations than is lobar pneumonia. He shows that it is liable to follow the aspiration of blood in the smaller bronchial tubes during and after operations performed upon the upper jaw, tongue, pharynx, and larynx. In fact, as Gould maintains, bronchopneumonia is the most common cause of death after these operations, and the surgeon should make every effort to carry them out without allowing any blood to be drawn into the trachea. Of course, as Cheyne points out, it is not pure blood which leads to bronchopneumonia, but rather what the blood may carry with it—that is, putrid particles and purulent masses.

Gould says that in former days surgeons would endeavor to prevent blood entering the trachea by working very hastily and by not giving enough of the anæsthetic to abolish the laryngeal reflex. Now a common procedure is to do a laryngotomy or a tracheotomy and plug the pharynx or the trachea so as to prevent the entrance of blood into the bronchi. He says that the position of the head is a great means of preventing this accident, and the head may be turned over on one side or thrown backward over the end of the operating-table.

Gould does not speak of the Trendelenburg position, and yet Dr. Keen has demonstrated, and to our mind conclusively, that in the great majority of operations in the region specified the Trendelenburg position alone will prevent aspiration of blood and septic particles into the bronchi during the operation. Of course, after the completion of the

operation such aspiration may occur, but I think that, weighing the relative advantages and disadvantages of preliminary tracheotomy and the Trendelenburg position, the balance stands decidedly in favor of the latter. In fact, a tracheotomy wound is sure to suppurate, and septic particles are apt to be drawn into the bronchi from this source, and the air inhaled is not properly warmed, and the bronchi are thus rendered liable to infection.

Gould shows that bronchopneumonia is often the proximate cause of death in cases of malignant disease of the jaws, tongue, palate, tonsil, pharynx, larynx, or œsophagus, which ulcerates into the trachea or the bronchus. As in middle-aged or elderly subjects bronchopneumonia of this type is invariably fatal, it is of the utmost importance to prevent its occurrence.

Many ordinary diseases belonging to the province of the physician are prone to develop surgical complications ; for instance, influenza may be followed by enlarged glands, disease of the joints, or disease of the bones ; typhoid fever by a multitude of surgical troubles, among which we may mention osteomyelitis, synovitis, arthritis, inflammation of the gall-bladder, epididymitis, urethritis, stricture of the œsophagus, abscess of the liver, boils, and carbuncles. Scarlet fever may be followed by joint disease, bone disease, and glandular disease.

A. Pearce Gould,¹ in the above-quoted article on the subject of the surgical aspects of pneumonia, says that there are three sequelæ of pneumonia which require surgical treatment : (1) Empyema, (2) pulmonary abscess, and (3) gangrene of the lung, empyema being by far the most common. He says that the frequency with which this sequence arises is not appreciated as it should be, and that when a practitioner once makes a diagnosis of pneumonia he is very apt to forget that in a few days an empyema may form. Gould thinks that this error has been fostered by the frequency with which these two diseases, or, rather, these two stages in one disease, have been contrasted ; and it cannot be emphasized too positively that the most usual cause of a secondary rise of temperature, or of a failure of the signs of pneumonia to clear up, is the formation of an empyema.

Gould shows that the pleura may be infected by the pneumococcus ; by the streptococcus pyogenes ; or by the tubercle bacillus ; from abscesses in near-by organs, such as the liver or the spleen ; or a subphrenic abscess or an abscess from the region of the appendix may burst into the pleural sac and cause purulent inflammation.

The empyema arising secondarily to pneumonia runs a more favorable course than any of the other forms, and is due to infection of the pleura

¹ Practitioner, February, 1900.

with the pneumococcus. Gould¹ maintains that the reason why the prognosis of empyema in childhood is so much more favorable than it is in adults is that in nearly all the cases in childhood it is due to the pneumococcus, while in adults one of the other above-mentioned causes is liable to be active.

Acute Empyema. A common cause of empyema, particularly in children, is pneumonia; this form gives the best prognosis. The disease may likewise be due to streptococci, tubercle bacilli, and typhoid bacilli, and there may be mixed infection with staphylococci or putrefactive bacteria. An empyema may quickly follow an attack of pneumonia, may arise after one of the exanthematous fevers, may develop during the progress of pulmonary phthisis, may be produced by wounds of the chest, or may arise secondarily after adjacent suppuration, cancer of the stomach, ulcer of the stomach, or malignant disease of the œsophagus.

The bacteriological differences in empyema were first carefully studied by Weichselbaum in 1886, although he did not discover the causative influence of either tubercle bacilli or typhoid bacilli. "The relative frequency of these bacteria varies somewhat in the statistics of different observers, but the most reliable figures give approximately the pneumococcus, 29 per cent.; streptococcus, 46 per cent.; saprogenic or putrid, 13 per cent.; and tubercle, 11 per cent. The relative percentages would vary somewhat, depending upon whether the cases were in children, in adults alone, or mixed. The pneumococcus hold the highest percentage in children (Netter's cases, 75 per cent.), while the streptococcus is the most frequent in adults (Netter's cases, 44 per cent.). The tubercle bacillus has not been demonstrated so frequently as would be expected (Netter's 156 cases gave but 10 per cent.); but it is pretty generally agreed that the absence of all germs in microscopical and cultural examinations points to tuberculosis. The other micro-organisms are comparatively infrequent, the staphylococcus the least so; but this is found in mixed infection more often than in pure culture. The Eberth bacillus of typhoid has been found by Weintraud, Loriga, and Pensuti. Gerhardt² reported a case of empyema following typhoid fever. At first the effusion was serous, but subsequently became purulent, as shown by punctures, and from the pus pure cultures of typhoid bacilli were obtained. The saprogenic micro-organisms are invariably found in all cases of putrid empyema, and the fact is well established that all cases of gangrenous pleurisy are produced by the invasion of these organisms."³

¹ Practitioner, February, 1900.

² Mittheilungen aus den Grenzgebieten der Medizin u. Chirurgie, 1899, vol. v., Part I.

³ Frederick N. Wilson, in the Post-Graduate.

Joseph McFarland¹ has recently reviewed the etiology and pathology of empyema. He says the condition is always infectious, but is not invariably specific. Among the causes which may lead to it he mentions: (1) Traumatism of the chest-walls; (2) local diseases of the chest-wall and lung; (3) lymph metastasis; (4) blood metastasis.

McFarland² carefully considers the bacteriology of empyema, and names as the most frequently discovered micro-organisms the streptococcus, pneumococcus, tubercle bacillus, staphylococcus, typhoid bacillus, influenza bacillus, Friedländer's bacillus, and bacillus coli communis. "The micro-organisms found in the pus vary considerably with the time of life at which the empyema occurs. Thus, in children the pneumococcus is most frequently met, while in adults it is the streptococcus. In adults the number of tuberculous empyemas is nearly twice as great as in children."

Loomis³ says empyema is a condition arising secondarily to tuberculosis in 83 per cent. of all cases.

Empyema is a very frequent condition in children; in fact, it is more common in children than in adults. "Mackey⁴ found that 40 per cent. of all the pleural effusions of childhood were purulent, while only 5 per cent. of those of adults were so." The subject of empyema in children has been recently reviewed by David Bovaird.⁵ He says that most of the reported cases in children have been in individuals under three years of age, but the disease is especially common during the first two years of life. The records of the pathologist of the New York Foundling Hospital show that in 82 cases of empyema 69 occurred in children who were less than two years old; one case was aged but two months and nineteen days. "The disease may occur at any age. Pleuritis has been found in the foetus and in the new-born."⁶ In 41 of the cases reported by the pathologist of the New York Foundling Hospital more or less pneumonia was present, but sometimes the only portion of the lung that was pneumonic was the superficial part which was in contact with the effusion. In such cases the author thinks that it is questionable whether the pleuritic or the pneumonic process was the primary one. In 28 cases no pneumonia was detected. In adults this fact would not lead to the positive conclusion that there had been no pneumonia, because the course of empyema is more protracted in adults than it is in children; but in children the clinical course is short, the conditions met with at the necropsy are practically those which existed during

¹ Philadelphia Medical Journal, August 8, 1900.

² Ibid.

³ Medical Record, September 29, 1900.

⁴ Philadelphia Medical Journal, September 8, 1900.

⁵ Medical News, December 23, 1899.

⁶ McFarland, in the Philadelphia Medical Journal, September 8, 1900.

life, and when pneumonia is not found in a child at the autopsy we can safely assume that it did not exist during life. It is a very general belief that pneumonia in some form precedes most cases of empyema in children. In this group of cases the post-mortem records show that out of 69 fatal cases pneumonia had existed in only 41. In 1 of the cases the empyema was secondary to general tuberculosis; in 1 to whooping-cough; in 2 to enterocolitis; in 2 to erysipelas; in 1 to gangrene of the skin; in 2 to diphtheria, and in 5 to measles.

In the condition which the pathologist designates as pleuropneumonia we are dealing with a state which is peculiar to children. Early in the case one lobe or two lobes present pneumonic consolidation; the pleura above this area is thick, white, and covered with an extensive exudate, and a small amount of serum is contained in the pleural sac. Microscopical examination shows that the exudate is formed of fibrin and pus. Later in the case the pericardial sac contains purulent fluid. This type of empyema is frequently complicated by peritonitis, pericarditis, or meningitis.¹

F. Leonard Vaux² says that pneumonia is the chief cause of empyema in childhood. Among other causes he names the exanthemata, tuberculosis, and septic processes anywhere in the body. In 288 cases of empyema in children seen in the Mt. Sinai Hospital pneumonia was the cause in 192 of them. Vaux says that tuberculosis is quite a frequent cause, but he takes the ground stated above, that in a tubercular empyema no bacilli may be discovered by microscopical examination or by cultures; and that it is proper to assume the case to be tubercular when no bacteria at all are discovered. The tubercle bacilli may be destroyed, but the other bacilli usually persist, and hence can be demonstrated.

Vaux maintains that empyema is most common among children who dwell in cities near the seacoast, probably because in such regions bronchopneumonia is common. The disease is predisposed to by unhygienic dwellings, parental neglect, and the absence of proper medical attendance during the existence of lung diseases. Jewish children are very prone to empyema.

In discussing the pathology of empyema F. N. Wilson³ points out that in the beginning the effusion is usually serous or sero-fibrinous, and becomes purulent later; but in some cases it is purulent at the very start. He also tells us that the appearance of the effusion depends to a considerable extent upon the bacteriological cause; for instance, in empyema due to the pneumococcus the effusion is rather puriform than purulent,

¹ Medical News, December 23, 1899.

² Montreal Medical Journal, November, 1899.

³ Post-Graduate.

and there is some fibrin held in suspension. When the streptococcus and the staphylococcus enter, the effusion is markedly purulent, and the thinner, puriform fluid due to the pneumococcus may become markedly purulent because of mixed infection with the two previously mentioned germs. In empyema produced by streptococci and staphylococci the pus is thick and yellow or greenish, and in a putrid empyema the pus is greenish or brownish, and has a very offensive odor. Wilson goes on to show that if an empyema is due purely to tubercle bacilli the effusion is thin and sanious, and occasionally, when bloodvessels have been eroded, contains blood.

McFarland¹ says that the pus of a pneumococcus empyema is usually of the variety which the older surgeons called laudable. "It is thick, rich in corpuscles, and is apt to be viscid. Sometimes it has a peculiar greenish color, though none of these peculiarities are constant, and there may be nothing about the pus to suggest from which infection it sprung." In a streptococcus empyema McFarland says that the fluid is at first slightly cloudy, but "soon becomes opaque and purulent." According to McFarland, the pus of a tubercular empyema is like that of a cold abscess that is "thin, watery, curdy, and deposits a powdery or flocculent sediment."

The early diagnosis of empyema is a matter of great importance. The earlier the diagnosis is made the better is the chance of cure without retraction of the lung and the formation of dense adhesions. When we think it probable that an empyema exists we ought to confirm the diagnosis by using an exploring syringe with aseptic care. We will thus be able to prove that there is pus in the pleural cavity. Some of the pus thus obtained should be studied microscopically and by culture methods, in order to make the bacteriological diagnosis.

A. Pearce Gould² maintains that the surgical diagnosis of empyema must be made by using an exploring syringe. He does not use the ordinary hypodermatic syringe, because the lumen of the needle is so small that it will not carry thick pus, the needle is so short that it will often fail to reach the pus, and is so slender that it is apt to be broken off if the patient moves suddenly.

Gould goes on to explain the conduct of diagnostic tapping in the following words: "Either a bottle aspirator or a special exploring syringe, well made and with a good piston, so that a vacuum can be really produced in its barrel, is the proper instrument for the purpose. It is best to use an aspirator; for then, if pus is found, a considerable quantity of it can be at once drawn off, and the patient relieved of respiratory and cardiac distress and put into a more favorable state

¹ Philadelphia Medical Journal, September 8, 1900.

² Practitioner, February, 1900.

for the subsequent operation. The exploration should always be made with careful antiseptic precautions; the skin should be sterilized in the usual way, and the needle or trocar and canula should be boiled. A general anæsthetic is not required for this little operation, but a local anæsthetic should be used—ethyl chloride spray is the most convenient. A spot where the dulness is well marked having been chosen, the skin is drawn up by an assistant so that the puncture shall be oblique when the parts are allowed to slip back. The spray is then directed on the chosen spot, and when the skin becomes dead white a narrow knife is introduced on to the upper edge of the rib, and then the exploring trocar or needle is thrust through this puncture with a sharp push, so as to transfix, and not push before it, the tissues. The vacuum is then connected, and the pus, if reached, will be seen to rise in the tube. The pus should be allowed to flow out slowly, and if it becomes mixed with blood or the patient begins to cough the canula should be withdrawn. Sometimes the pus is very thick, and flakes of fibrinous pus will block up the canula; this is indicated by the *sudden* arrest of the flow of pus. When this occurs a straight, properly fitting plunger is passed down the canula to free it. In certain cases these flakes are so numerous that it is impossible to remove any large quantity of the pus by the aspirator.

“A more troublesome circumstance is the failure to find pus when the history of the case and the physical signs clearly point to its presence. This most often happens in cases of small empyema—localized or loculated empyema, as the condition is often named, in contradistinction to general empyema. But a ‘dry tapping’ may be due to a faulty procedure; thus it may arise from a tubular needle being thrust through the skin—without a previous incision—and cutting out a plug of skin which exactly fits and blocks the end of the needle; or the canula may push before it the parietal pleura, or a layer of false membrane lining it, instead of puncturing them; or it may be thrust too far—into the lung—or introduced too low—*e. g.*, into the liver—or too high, above the level of the pus. In the case of quite a small collection of pus two or three punctures may have to be made before it is found. When the canula is withdrawn the skin is allowed to slip down, and the skin puncture is dressed with either a collodion dressing or a pad of cyanide gauze fixed in place with strapping.”

Wilson, in a previously quoted article, says that auscultation and percussion will demonstrate the presence of fluid, but will not indicate the character of the fluid, and the latter is to be determined by aspiration—a procedure which is perfectly safe if properly carried out.

Bovaird¹ says that there is scarcely any disease in children in which

¹ Medical News, December 23, 1899.

an erroneous diagnosis is so frequently made as in empyema. He thinks the chief reason for these mistakes is that physicians have trouble in eliminating from their minds the clinical features of the disease as met with in adults, for they recall that in adults the disease is apt to follow a distinct and definitely recognized attack of pneumonia, and when they have a record of such an attack in an adult they make the diagnosis from one or two symptoms; but in a child the pneumonic attack may have been entirely unrecognized and the physician may not think of the existence of an empyema.

Vaux¹ says that the diagnosis must be confirmed by puncture, but thinks that a good deal can be learned from the physical signs—and the physical signs are in children somewhat different from those met with in the adult.

In discussing the treatment of empyema we would insist that it is essentially a surgical disease, and that the treatment should be, as Verneuil says, like that of any other abscess. Occasionally an empyéma recovers after spontaneous rupture into a bronchus, but such a rupture is in itself a very dangerous matter. We ought to apply surgical treatment very early, and thus avoid the formation of embarrassing adhesions and the development of various other dangers and complications. As Desguin² says, if acute empyemata were, as a rule, treated early surgically the extensive operations necessary for chronic empyema would be very rarely needed. In a recent case the lung is still able to expand; in an older case it cannot do so. As John C. Munro³ points out, too much cannot be said to convince physicians that they ought to submit patients to early operation, in order to insure rapid expansion of the lung, and if this principle were strictly followed the operations of Schede and Estlander would be very rarely required.

It occasionally happens that in a patient who has been treated by conservative methods the lung will expand rapidly after a late operation, but such cases are rare and are dangerous as precedents. In a recent case we must choose between thoracentesis and pleurotomy (Verneuil). It is true that occasionally a pneumonic empyema in a child will recover after tapping, but such an event is the exception rather than the rule, and empyemata due to other organisms will not be cured by tapping.

Tapping, or aspiration, is valuable as a diagnostic aid, is sometimes used as a palliative treatment when there is advanced pulmonary disease, and is often performed as a preliminary to radical operation, enabling the surgeon to remove a considerable portion of the effusion, and

¹ Montreal Medical Journal, November, 1899.

² Annales de la Société Belge de Chirurgie, June, 1900.

³ Medical News, September 2, 1899.

thus permit of expansion of the lung, relieve the dyspnoea, and make it far safer to administer an anæsthetic. Thoracentesis is perfectly safe if carefully performed, but if not performed aseptically it may be followed by putrid empyema. As Wilson says, many surgeons have altogether abandoned aspiration as a method of treatment, and this proper view is not to be set aside because some few cases have been reported—chiefly in children, and when the infection was caused by pneumococci—in which aspiration has been followed by cure. Wilson maintains, however, that in one class of cases aspiration is the only procedure which is justifiable—*i. e.*, cases in which the patient is very septic and nearly moribund—a condition which is so grave that it contraindicates the administration of any anæsthetic and the exposure to any but the most trivial shock. He states that we most frequently see such cases in children in whom the disease has existed for a number of days or perhaps weeks. Aspiration in such a case does not produce much shock, relieves the symptoms, and lessens the amount of septic matter which is absorbed; and, after its performance, by the administration of nutritious food and stimulants we may be able to put the patient into a condition in which he or she will tolerate the more radical procedure. Wilson urges this view because he has seen such cases die on the table or within a few hours after operation, and he thinks that they might have been saved by a more conservative plan. Pure typhoid empyemata may sometimes be cured by tapping or aspiration. In Gerhard's¹ case the pus was absorbed spontaneously. Fränkel and Weintraud² have reported similar cases.

Wilson maintains that when a complete aspiration is to be performed it ought always to be done slowly. The patient should not sit up by his own voluntary muscular effort, but should be held semi-erect on pillows, or may even be lying down. If he becomes faint or coughs violently we infer that the pressure is being too rapidly removed from the lung and the bloodvessels of that organ are being filled up too quickly; we ought to lessen the rate of withdrawal of the fluid or suspend it for a time.

Munro³ says that he makes it a rule to explore diagnostically with a trocar as soon as the patient is under the influence of an anæsthetic, and that in an old case of left-sided empyema in which there is considerable cardiac displacement he withdraws the pus by preliminary aspiration before incising the pleura, in order to avoid the danger of embolism.

Every case of acute empyema should be promptly operated upon, and it ought, as Gould says, to be operated upon even if it has broken into

¹ Mittheilungen aus den Grenzgebieten der Medicin u. Chirurgie, 1899, vol. v., Part I.

² British Medical Journal, March 31, 1900.

³ Medical News, September 2, 1899.

a bronchus. Ordinary tubercular cases should be operated upon, but in a case of empyema with rapidly advancing pulmonary phthisis it is by some considered best to rely upon repeated tapping. Some authors maintain that an empyema arising secondarily to tubercular disease of the lung produces a favorable effect upon the pulmonary disease. A serous effusion sometimes benefits tubercular lung disease. It is alleged that an empyema benefits it still more. Henry P. Loomis¹ is a believer in the beneficial effect of empyema upon tubercular disease of the lung, and explains it on the ground that it causes compression and acts like pneumothorax. Loomis says, in view of the curative tendency of this compression, tapping and drainage should be resorted to only after careful consideration and only when special indications arise, for statistics collected by Czernicki and Bomber have proven conclusively that quiescent tuberculosis of a lung compressed by empyema may be aroused to vitality by such expansion as follows either thoracotomy or aspiration.

In a large empyema aspirate a few hours before the operation, in order to relieve pressure upon the heart, lungs, and vessels. As Gould² shows, this preliminary aspiration will lessen the actual shock of the operation and will put the patient in a better condition to withstand the shock. That operation is usually urgently necessary in a case of empyema has been insisted upon by many authors. Gould insists on the necessity for prompt surgical relief of the condition, and reports three striking cases to prove his contention.

Gould was asked to operate for empyema upon a strong young man, and the message requested him to come that day or the next. He went within a few hours of the reception of the summons, and found the patient cyanotic, in extreme distress, and with a very small pulse. He immediately opened the left pleura and gave exit to a large amount of pus, but it was too late; the patient died of cardiac thrombosis before the surgeon left the house.

Another time a physician called upon him and asked him to operate upon a right-sided empyema, and the suggestion was made that the operation be done the next day. He, however, went at once, but on arriving at the house found that the patient was dead.

In another case a young woman died from a pulmonary embolism just after the performance of an operation had been arranged for and before it could be actually carried out. Gould says that such an experience teaches us that while it may be safe and wise, as a rule, to postpone operations until proper arrangements can be made, we must never delay when there is high pleural tension with serious pressure upon

¹ Medical Record, September 29, 1900.

² Practitioner, February, 1900.

the mediastinum and lung; and that if for any reason the operation must be temporarily postponed relief should be afforded by aspiration.

The question of what anæsthetic should be administered in these operations has excited considerable discussion. Most surgeons prefer chloroform. Some use nitrous oxide and oxygen, some chloroform and oxygen. In the great majority of cases ether can be given with safety if it is administered by a skilful and experienced anæsthetist. I have frequently used it in children, even in young children. In an advanced case in which there is large effusion, preliminary aspiration should be done, and this will render the administration of ether much safer. In the majority of cases I think that ether is to be preferred. In cases that are so far advanced as to be in peril of immediate death the operation in adults can be done very satisfactorily after the infiltration of the tissues with eucaine, but this is by no means so satisfactory in children. Local anæsthesia is far more satisfactory in simple pleurotomy than in cases in which a portion of a rib is resected. In a case perilously far advanced, especially if the patient be a child, it is sometimes expedient to perform simple pleurotomy. The fact is it takes a very small quantity of ether to anæsthetize a young child, and after it has been anæsthetized the operation can be quickly completed. As soon as the pleural sac has been incised the administration of the anæsthetic should be suspended.

The operation of pleurotomy may be performed by simple incision of the pleura or by incision of the pleura after resection of a rib. Simple incision of the pleura can be done very quickly and with perfect satisfaction under local anæsthesia.

In some cases very excellent drainage is afforded, but in others the drainage is poor. If this method is selected it is usually advisable to bite away a portion of the rib below with Rongeur forceps, in order to prevent blocking of the drainage-tube from pressure.

In performing this operation the patient is laid upon his back, with the diseased side by or over the end of the table. He must not be placed upon the sound side, because if this is done it will interfere with respiration. In some cases the patient is placed semi-erect.

Just before operating, if we have not done so already, we should prove that pus is present by using an aspirator. The old idea was that it is necessary to make our incision at the bottom of the pleural cavity, but we now know that this is not so, because the pleural cavity is not drained simply by gravity, but drainage is greatly aided by the expansion of the lung and the ascent of the diaphragm. In general empyema the incision should be made in that region which is last reached by the expanding lung—in the sixth interspace and in the mid-axillary line. In an encysted empyema the incision should be made directly over the purulent collection.

Simple incision is frequently a satisfactory operation in children, but it is not used in adults except in cases of extreme urgency. The rule in cases of empyema should be to excise a rib. In general empyema a portion of the sixth rib in the mid-axillary line should be removed because, as Hutton has shown, this is over the portion of the lung that expands last; and if an incision is made front or back of the suggested point, the lung, as it expands, will occlude the opening for drainage, and an undrained pus cavity will remain in the mid-axillary line. In an encysted empyema a portion of rib directly over the purulent cavity is removed.

For a long while it was maintained that resection of a portion of rib is objectionable, because air freely enters into the pleural cavity and prevents lung expansion; but this theoretical danger is not practically realized, for in the vast majority of cases the lung expands and the cavity closes.

After opening the chest the surgeon should introduce his finger, break up and aid in the removal of caseous or fibrinous masses, and determine whether the lung is expanding. If he finds that it is held down by firm adhesions he may be certain that pleurotomy will not effect a cure. In a very favorable case the lung will completely expand as the chest empties. Some surgeons advocate the careful loosening of those adhesions which are within reach in cases in which the lung fails to expand; but this procedure is dangerous, as it tears bloodvessels and causes hemorrhage. It is safer to depend upon lung gymnastics by means of expiratory efforts, carefully regulated and employed for some time during convalescence, to distend the lung. If the lung refuses to expand after the operation the cavity will not be obliterated, the condition will become one of chronic empyema, and Schede's or Estlander's operation must be performed. The drainage-tube should be short. As Munro says, it ought not to project beyond the inner surface of the chest, because a short tube drains better and does not irritate the lung. After the completion of the operation it is important to have the patient sitting up as soon as possible and to insist upon exercise of the lung and chest.

In discussing the relative merits of thoracentesis and pleurotomy with excision of the rib Verneuil¹ strongly advocates the latter method. Some surgeons at once irrigate after the incision. I have never been in the habit of doing so chiefly because of the belief that the custom is dangerous. Verneuil² opposes irrigation in the majority of cases on the ground that it disseminates the infection, and in this notion he is in agreement with Terrier. Desguen³ does not irrigate immediately after

¹ *Annales de la Société Belge de Chirurgie*, June, 1900.

² *Ibid.*

³ *Ibid.*

an operation; but later, if the temperature rises and the discharge becomes foul, he does so, using a weak solution of chloride of zinc. Putrid empyema ought to be irrigated, because the danger of the absorption of toxins is considerable and that of washing out the pleural cavity is comparatively slight. The cavity of a putrid empyema should be irrigated with salt solution, and subsequent to the operation irrigation should be employed once or twice a day. To cleanse the cavity thoroughly it is necessary to immerse the patient in a bath of salt solution and let him breathe while the drainage opening is under the surface of the fluid. Willems¹ opposes the use of lavage as a routine procedure, and maintains that cases in which lavage is not used recover sooner than those in which it is. He irrigates only when he finds that there is fever and putridity of the discharge. When he does irrigate he uses oxygenate of water.

Verneuil² maintains that in many cases it is advisable to curette the walls of the cavity, but he thinks that there is no possible use in injecting emulsion of iodoform, permanganate of potassium, and such agents.

A. Pearce Gould,³ in discussing the operation for empyema, insists, of course, that it shall be performed with antiseptic care, and he advises that in most instances a general anæsthetic be given, although it must be given with great care, because of the embarrassment of the circulation and the respiration. He does not give ether, but generally uses chloroform, and stops its administration as soon as the pleural sac has been opened, because the further steps of the operation are nearly painless. He thinks that the best anæsthetic for this operation is a mixture of nitrous oxide and oxygen, because it does not interfere with the cardiac action or with the interchange of gases in the lung, and has no unpleasant after-effects; but he would use this only when it can be given by an expert and in cases which present no particular difficulty and which can be operated upon with rapidity.

Gould says that the patient should lie upon his back. He does not consider it a safe procedure to place the patient on his sound side, and thinks that if it is necessary to open the chest very much toward the back the patient should be turned over on the diseased side and the surgeon should stand behind him while operating. In a general empyema he makes an incision in front of the angle of the scapula and at the level of the ninth rib, and he believes that a portion of the rib should be resected in preference to opening through an intercostal space.

After the opening has been made into the pleura the surgeon, says Gould, should introduce his finger to find out whether there are masses

¹ *Annales de la Société Belge de Chirurgie*, June, 1900.

² *Ibid.*

³ *Practitioner*, February, 1900.

of coagulated lymph within the pleural cavity. If such masses are found they ought to be removed with forceps. If the flow of pus slackens it can be encouraged by turning the patient over on the diseased side in order to empty the sac.

Gould is opposed to irrigating the pleura, although he wipes it out with swabs of sterile gauze held in ovum forceps, and maintains that wiping will greatly lessen subsequent suppuration and facilitate healing. He inserts a drainage-tube the size of the forefinger, and permits it to project about an inch within the pleura, fastening it by tapes around the chest. It is a good plan to have a special tube with a flange on it, but if there are no flanges upon the tube to which to fix the tapes the tube should be stitched to the edges of the skin incision. Gould¹ usually places a suture at each end of the wound, in spite of the fact that this proceeding has been condemned by authority.

The same author points out that in some cases after pus has flowed rapidly from the pleura, hemorrhage takes place, this being due to the fact that numerous vessels in the pleura have been suddenly relieved from pressure, and the flow of blood is increased by the respiratory movements and the improved action of the heart. Such a hemorrhage may be extremely serious. When hemorrhage occurs the surgeon should insert the tube quickly, bind on a thick dressing as firmly as the patient can tolerate, get him back to bed, and make him lie on the diseased side. He utterly condemns any attempts to arrest the hemorrhage by thoroughly emptying the cavity or introducing astringent materials. Of course, Gould does not mean hemorrhage from the wound made by the surgeon. Such hemorrhage should always be arrested by the ligature.

Gould opposes breaking down adhesions with the finger, because such adhesions are apt to be vascular and to bleed when torn, and also opposes the practice because the adhesions aid somewhat in repair.

After the cavity has been thoroughly wiped it should be explored with the finger a second time, in order to learn how much the lung has expanded. In some cases the lung will at once almost completely expand, and the degree to which it expands at the time of the operation is a pretty fair index of the rapidity with which we can expect healing to take place. The author says that it is an interesting fact to observe complete expansion of the lung in spite of the opening in the pleura through which the air passes. This, he says, is primarily produced by the free circulation of blood through the compressed lung, which opens the latter out again. It is also partly produced by pressure during expiration, but sometimes we can feel the lung expanding likewise during inspiration.

The dressing, Gould² thinks, should be large, thick, and absorbent,

¹ Practitioner, February, 1900.

² Ibid.

and either aseptic or antiseptic ; it should be held in place by a flannel binder pinned tightly enough to hold the dressing in place, but not so tightly as to embarrass respiration. The first day after the operation the dressing should be changed every few hours ; then for a day or two it should be changed about twice a day, and after that, as a rule, once a day.

Immediately after the conclusion of the operation the patient is placed recumbent or almost recumbent in bed, and shock is combated by appropriate treatment. Gould maintains that the day after the operation, or at least as soon as the heart is sufficiently strong to justify the action, the patient should be propped up in bed, and when recumbent should be told to lie on the diseased side. He insists upon this because the upright position favors drainage, fuller respiratory movements, and stronger cardiac contractions. Of course, as Gould points out, some patients are too sick to be raised in bed for many days after the operation. For the same reason the above-quoted surgeon encourages the patient to take deep breaths, and as soon as the pulse and temperature justify it to sit up out of bed and to move about a little. When the wound is healed further expansion of the lung is stimulated by exercise.

Gould¹ maintains that the tube should not be removed at all for three days after the operation ; after that, when it will be easy to reintroduce it, it may be taken out and cleaned every day or so. When the discharge has become reduced to a small quantity some surgeons diminish the size of the tube, but Gould knows of no advantage in this, and thinks that the tube ought to be left in until the pleural cavity has closed around it. This may be assumed to have taken place when only one or two drachms of serum are discharged in twenty-four hours ; and it may be proved to have taken place by passing a bent probe into the sinus and rotating its bent end, to determine the size of the intrathoracic cavity. When the pleural cavity has closed around the tube the latter should be withdrawn at once and not gradually shortened. For three or four days after the withdrawal of the tube a director should be passed along the sinus for its whole length once a day. If there is any accumulation of pus taking place within the chest the director will find it, and if necessary the tube can be again inserted. Gould² shows that the temperature chart also gives important information on this point. We cannot lay down a time at which it is proper to remove a tube, because a case of empyema may be entirely healed in two or three weeks after operation ; but four or six weeks are often required, and even months may be needed. The conditions upon which a favorable course depend are : (1) The absence of firm, thick masses of organized lymph,

¹ Practitioner, February, 1900.

² Ibid.

binding down the compressed lung ; (2) the thorough cleansing of the pleural cavity at the time of operation ; (3) efficient drainage ; (4) resilient chest-walls ; (5) strong cardiac and skeletal muscles ; and (6) the absence of double infection and other diseases.

Joseph D. Bryant¹ has recently discussed the treatment of acute traumatic empyema, and has reported a case. A man, aged twenty-four years, had had a blunt tool thrust through the chest-wall below the right nipple, the pleural cavity being opened but the lung being uninjured. The wound was enlarged by the surgeon and the pleural cavity was irrigated with salt solution. In view of the nature of the accident and of the object which penetrated the chest it was deemed certain that infection would occur ; therefore a rubber tube was inserted for drainage. Infection did occur, but it was found that whenever a syringe was inserted into the rubber tube and pus was withdrawn, violent coughing was caused by the change in atmospheric pressure ; therefore Bryant packed the wound around the tube so that air could not enter there and put a stop-cock on the tube. He then used the syringe, and afterward applied a collapsed rubber bag over the end of the tube. By this method air could not enter and fluids could drain out. The patient managed the appliance himself in a satisfactory manner.

DOUBLE EMPYEMA is an extremely serious condition, and numerous cases have been reported. W. A. Milligan² has recently reported a case of double general empyema in a child, operated upon by C. A. Morton with success. In this case the left side was aspirated, and the next day the right side was also aspirated. Two days later the left pleura was again aspirated. Five days after admission the right side was opened by incision, portions of the fifth and sixth ribs being removed. Two days later a similar operation was performed on the left side. The course pursued by Morton is that usually advised—*i. e.*, to operate first on one side, and then, after an interval of one day, two days, or more, to operate on the other, aspirating as a preliminary measure to diminish the pressure before operation.

Milligan, in the above-mentioned paper on double empyema, says that he has found two recorded cases in which aspiration alone effected a cure. In regard to the important point whether we can open both pleural cavities at the same operation without fatal collapse of the lungs, he says that we have in support of this contention Pollard's classical case, in which both pleuræ were opened by a gunshot wound, and there was no collapse of the lungs. He states that there are two recorded cases in which each pleural cavity was deliberately opened at one operation, and both of these cases recovered ; but, nevertheless, he

¹ Medical News, July 28, 1900.

² British Medical Journal, January 6, 1900.

believes that the double operation should not be done unless it is absolutely called for, because it is much safer to operate on one side, and, after an interval, on the other.

Milligan points out that the object of waiting is to allow the lung to form adhesions, so that it may in its turn serve to expand the second lung when the pleural cavity is opened. If it is thought to be absolutely necessary to open both sides at the same operation then he would follow the advice of Dr. Coupland and Mr. A. Pearce Gould, and would first aspirate both sides. Milligan says that if one empyema or each empyema is localized the danger of opening both sides together is not nearly so great. He further points out that the risk of giving an anæsthetic is very much greater in double than in single empyema. He states that the A. C. E. mixture and chloroform seem to be the favorite anæsthetics. Certainly in double empyema very little of the anæsthetic should be used, or, better, the operation should be done under local anæsthesia.

Verneuil¹ advocates operating upon both sides in double empyema.

CHRONIC EMPYEMA. Verneuil² points out that in chronic empyema the lung being retracted and a permanent space remaining in the pleural cavity with sinuses, we should endeavor to determine the exact condition by the use of the X-rays, and should then plan out what operation we will perform. In comparatively recent cases he operates by the method of Estlander; in old and very large cases he employs the method of Schede. Some few surgeons prefer the method of Delorme. The basic principle of every one of these operations is extensive resection of the chest-wall in order to permit it to fall in.

Depage³ maintains that no one of the three above-mentioned operations will bring about a cure if the lung is collapsed into the costo-vertebral hollow, and that in such cases it is necessary to resect the clavicle and the first rib.

Willems⁴ thinks that these extensive resections of the chest-wall are very risky proceedings in weakened patients, and in a chronic empyema he would perform Estlander's operation early—that is, just as soon as scoliosis is first manifest. He thus avoids the necessity of performing at a later date a very extensive resection.

ENCYSTED EMPYEMA. The above remarks refer particularly to general empyema. Encysted empyema is very much more difficult to diagnosticate. As Verneuil⁵ points out, the diagnosis can often be made (or rather confirmed) by the X-rays. In acute general empyema it is proper to resect a portion of the sixth rib in the mid-axillary

¹ *Annales de la Société Belge de Chirurgie*, June, 1900.

² *Ibid.*

³ *Ibid.*

⁴ *Ibid.*

⁵ *Ibid.*

line. In encysted empyema the incision is made over the region in which the empyema is located. Verneuil¹ says that he incises an encysted empyema, breaks down the septa, and drains.

William S. Dodd² reports a case of empyema sacculated between the heart and lung. In this case an operation was performed, a portion of the eighth rib being removed in the mid-axillary line, and a small amount of pus was evacuated. The operation did not arrest the progress of the disease. The patient died, and the post-mortem showed that there was an encapsulated abscess between the pericardium and the lung, containing a considerable amount of pus covered in by the lung, and in relation to the anterior portion of the chest, in the fourth intercostal space from the mammary line for about 3 cm. in the direction of the sternum; but directly under a part of this was the pericardium. The view of the surgeon during the patient's life was, that there was another abscess, but that it had not been located.

What is known as interlobular empyema is very difficult of diagnosis, and, as Verneuil says, it should be treated as we treat an abscess of the lung.

PULSATING EMPYEMA. This subject is clearly and briefly discussed in the *Lancet* of March 10, 1900. The recorded cases are referred to, and it is shown that after an operation for this condition it is possible for the lung to expand—a view which is opposed to the usual teaching on the subject since the time Comby asserted that in pulsating empyema the lung is permanently contracted.

The Surgical Treatment of Pulmonary Tuberculosis. The notable advance in surgery in recent years, the invasion of regions hitherto considered inaccessible, and the cure of diseases once thought to be incurable make it natural that efforts should be made to treat pulmonary tuberculosis by surgical means. As a matter of fact, the majority of the reports relating to the surgical treatment of phthisis have been unfavorable, but occasionally the attempt succeeds. The attempts have not been altogether modern, because as long ago as 1710 Hastings in one case and Storek in another inserted drainage-tubes into cavities in the apices of tubercular lungs.³

In 1891 the Congress for the Study of Tuberculosis was held in Paris, and Walter C. Wood⁴ says that Porrier and Jonnesco reported twenty-nine cases in which pulmonary cavities in the apex had been incised and drained, four of the cases being looked upon as cured and fifteen as improved. One could not be traced, and nine died.

¹ *Annales de la Société Belge de Chirurgie*, June, 1900.

² *Medical Record*, October 7, 1899.

³ *New York Medical Journal*, December 30, 1899.

⁴ *Ibid.*

Wood tells us that in 1892 Tuffier resected a tubercular right apex, and the patient was alive and apparently well two years later.

The next plan to excite interest and attention was that followed by Dr. John B. Murphy, of Chicago, *i. e.*, the collapse of the lung by the creation of an artificial pneumothorax, this being produced by the introduction of nitrogen gas into the pleural sac.

Wood¹ says that there are four plans to be considered in the surgical treatment of pulmonary tuberculosis: (1) The aspiration of cavities and the introduction into them of drugs; (2) the incision and drainage of cavities—what is known as pneumonotomy; (3) pneumonectomy, or excision of a tubercular area, and (4) obliteration of the cavity by causing collapse of the lung. We would add to Wood's statement that collapse of the lung can be brought about not only by injecting the pleura with nitrogen gas, after the method of Murphy, but by the performance of extensive rib resection, as originally suggested by Dr. Allis.

Aspiration has proved an unqualified failure. Verneuil² points out that to simply open and drain a tubercular cavity is no more apt to cure the condition than it would be likely to cure any other ordinary cold abscess, and that aspiration is, therefore, futile as a means of treatment. If we propose to treat the case surgically it is necessary to incise the cavity, cauterize its walls, and drain. Verneuil states that even this radical procedure has not furnished encouraging results, although some apparently successful cases have been reported. He does not consider that there is much encouragement for the surgeon in incising and draining tubercular cavities.

Wood³ says that incision and drainage of a tubercular cavity is indicated only when there is very little general tubercular involvement of the lung tissue and when the patient is suffering from the secondary septic symptoms of a readily recognized and located cavity; and that the idea of the treatment is to relieve the symptoms of sepsis, in order that the tubercular disease may have a better chance to reach a natural cure. He also states that the operation is followed by rapid amelioration of fever, lessening of expectoration, and diminution of cough; and that while a case is occasionally cured, the majority of the patients are at length destroyed by the tubercular disease.

Verneuil⁴ points out that before a surgeon ventures to operate upon a tubercular cavity he must ascertain that there is but a single tubercular focus in the lung and that this cavity is of medium size; even then he should operate only when the general condition of the patient is good.

¹ New York Medical Journal, December 30, 1899.

² Annales de la Société Belge de Chirurgie, June, 1900.

³ New York Medical Journal, December 30, 1899.

⁴ Annales de la Société Belge de Chirurgie, June, 1900.

Yet we must note that these are exactly the sort of cases that in not a few instances recover without any operation at all. In locating a cavity the X-rays are often a great help. Verneuil thinks that the operation for tuberculosis when a cavity exists is justified in very few cases.

Whereas it is true that a tubercular focus has on several occasions been successfully extirpated from the lung, the disease practically invariably destroys the patient in the end. A tubercular focus has in several instances been removed with a cautery, but Wood¹ voices the general opinion when he says that pneumonectomy is unjustifiable in tubercular disease. Verneuil² says that the results of extirpation of tubercular areas in the lung are almost always bad, and that although a few cases have recovered, they would have probably gotten well if no operation had been done.

The method employed by Murphy, in which he collapses the lung, is still upon trial. It seems to us that it has not been tried as extensively as it should have been. There are known clinical facts which seem to indicate that such a plan ought to be of benefit, and some striking reports apparently show that it is sometimes of benefit. The method should be given a thorough trial. Wood³ shows that the collapse of the lung materially lessens the size of the cavity and forces its contents to drain through the bronchial tubes, and also gives the lung rest and permits of cicatrization of the area of disease.

Murphy in his original paper pointed out that tubercular lungs which have collapsed because of pleurisy or emphysema or of operations on the chest-wall have often recovered and become practically healthy; and, further, that in cases in which healed tubercular lesions are found in the lungs there is contraction of the chest-wall proportionate to the amount of lung tissue which was involved.⁴

Wood⁵ says that if there are adhesions and much consolidation Murphy's method cannot be used. In an ordinary case Murphy injects from 50 to 200 c.c. of gas. The required amount is the quantity which causes the respiratory sounds to cease. The gas remains in the pleura for several months without materially diminishing in amount. When it is withdrawn the lung promptly expands.

Murphy has reported a few cases in which favorable results seem to have been obtained, although scarcely a long enough period has passed as yet to allow him to positively assert the curative influence of the treatment.

Henry P. Loomis⁶ publishes some personal observations on the effects

¹ New York Medical Journal, December 30, 1899.

² Annales de la Société Belge de Chirurgie, June, 1900.

³ New York Medical Journal, December 30, 1899.

⁴ Ibid.

⁵ Medical Record, September 29, 1900.

⁶ Ibid.

of intrapleural injections of nitrogen gas in tuberculosis. He points out that three-fourths of the cases of primary pleurisy are really tubercular, and he thinks that in some of these cases the pleurisy may have arisen secondarily to a small pulmonary lesion—which lesion has been rendered quiescent or may even have been cured by the pressure of the effusion. We know that individuals who have suffered from primary tubercular pleurisy are apt to develop pulmonary tuberculosis months or years afterward, and this may be due to the fact that a pulmonary lesion which was rendered quiescent by the pressure of the effusion has, after the cure of the latter, again become active. Loomis says that it is known that the results upon pulmonary tuberculosis, if pus forms within the pleural sac of the diseased side, are more favorable than when the effusion is simply serous. He points out that of 164 cases of empyema operated upon 144 recovered; and he further says that when we remember that empyema is secondary to tuberculosis in over 80 per cent. of cases, this seems to indicate that empyema has a curative effect upon tuberculosis of the lungs. The reason that empyema has a more favorable effect upon a tubercular lung than a serous effusion is that it compresses the lung for a longer time and more firmly, and because it is accompanied by the formation of dense adhesions which prevent pulmonary expansion.

Loomis' view as to the number of cases of empyema which are due to tubercle is in opposition to other views previously quoted (see Emphyema).

Loomis alludes to the well-recognized clinical fact that if pneumothorax develops in the course of pulmonary tuberculosis it may greatly improve or even cure the tubercular area. He thinks that a part of the benefit which takes place in such cases is due to the fact that the lung is forced to rest, and rest checks the development of infection in new regions and yet does not interfere with the circulation. It enforces drainage of secondary deposits through the bronchi, approximates the walls of cavities, and thus gradually empties them, diminishes the lymphatic circulation, and favors the encapsulation and cicatrization of tubercular areas. Loomis¹ concludes that clinical experience definitely proves that compression of the lung favors the healing of tubercular processes.

Murphy's treatment (which was suggested by Forlanini, but which was perfected and first employed by Murphy) seems to fulfil the conditions necessary to collapse the lung. Loomis² has employed this treatment, and thinks that it is of very great value. He says that after the injection the expectoration will distinctly increase during the first twenty-

¹ Medical Record, Sept. 29, 1900.

² New York Medical Journal, Sept. 29, 1900.

four hours, but that after a few days it will quickly diminish, and the patient will rapidly gain in weight. According to Loomis, the temperature is less affected than are the other constitutional symptoms. Night-sweats gradually disappear, hemorrhages cease, and the appetite notably improves. It does not seem to him that the physical changes in the lungs show as much improvement as the subjective symptoms would suggest; in fact, when the gas is absorbed and the lungs are again examined in most cases we can detect no marked improvement in the diseased area. He is certain that if permanent results are sought for we must keep the pleural sac filled with gas for at least six months. The most remarkable effect of these injections is, according to Loomis, the arrest of pulmonary hemorrhage, which stops at once after the injection. He says that we should expect the best results from this treatment in tuberculosis of one apex in an early stage, the lungs being free from adhesion; but that a localized cavity at the apex is also favorable for the treatment. The more Loomis has used the gas the more he has been tempted to employ it in advanced and apparently desperate cases. His conclusions are as follows:¹

“ANALYSIS OF CASES INJECTED:

- “1. Total number of cases, 18.
- “2. For pulmonary hemorrhages, 8 cases.
- “3. For effect on lungs, 10 cases.
- “4. Effects on hemorrhage. Stopped at once.
- “5. Effect on lung condition. In the majority of cases the physical signs remained the same except that râles diminished or disappeared. Only one case showed a marked improvement. Pleurisy was controlled at once.
- “6. Number of cases gained in weight, 16.
- “7. Number of cases lost in weight, none.
- “8. Average gain in weight per patient, $7\frac{1}{2}$ pounds.
- “9. Number of injections given, 29.
- “10. Average amount of gas injected, 107.5 c.c.
- “11. Number of cases in which improvement was noted: In (1) cough, 13 cases; 3 slightly and temporarily. (2) Expectoration, 11 cases. (3) Fever, 4 cases.
- “12. Number of cases during the past year in which the injections were tried and failed owing to the inability to introduce the gas (adhesions, etc.), 8.

“REMARKS ON TREATMENT. I am convinced that intrapleural injections of nitrogen gas will have a permanent place in the treatment of pulmonary tuberculosis.

¹ Medical Record, September 29, 1900.

"1. It is a treatment that has a future. I would advise its more extended use; only in this way can we ascertain the kinds of cases to which it is best applied.

"2. I have never seen any bad results or even unpleasant effects following the injections.

"3. I have seen no cases result in absolute cure of the disease.

"4. I have certainly seen the apparent arrest of the disease in two cases, and the disappearance of such constitutional symptoms as expectoration, fever, and cough in a number more. Sufficient time has not yet elapsed to say whether in even the most favorable cases the activity of the disease may not return.

"5. The local improvement is not so apparent as the constitutional.

"6. A marked gain in weight is found in every case injected. This is so universal as to be astonishing, especially as the cases have had no other treatment and many of them have been in hospital wards and under anti-hygienic surroundings; yet the gain in weight has followed almost immediately after injections, and when a patient had been losing weight before the injections he suddenly began to gain. It is very difficult to explain this effect except by the marked effect upon the pulmonary lesion.

"7. That this method of treatment will stop pulmonary hemorrhages I am thoroughly convinced. I have never seen it fail even in one of the most desperate cases upon which it was tried. If these nitrogen-gas injections have no other place in the treatment of pulmonary tuberculosis it seems to me that their ability to arrest pulmonary hemorrhage gives them a place which no other method we have at the present time can occupy."

Alexander Hugh Ferguson¹ has reported a case of pulmonary tuberculosis successfully treated by drainage and the injection of iodoform. He first performed an operation for an abscess of the chest-wall which was connected with caries of the third rib, and he at that time concluded that there was a connection between this region of disease and an intra-thoracic trouble. Three weeks later he performed another operation, but was unable to find any evidence of extension of the disease of the rib inward. He therefore incised the pleura and inserted his index finger, and found that the apex of the lung seemed to be smooth, soft, resilient, and crepitant, and that it expanded during inspiration. When he passed his finger for its full length into the pleural cavity he found a large mass opposite the fourth and fifth ribs attaching the lung to the chest-wall. He closed the wound in the pleura and removed a portion of the fifth rib in front of the mass, cut through the pleura, sutured the

¹ Medical News, March 17, 1900.

mass to the parietal pleura, packed with iodoform gauze, and determined to wait for a few days. Two weeks later he pushed a grooved director through the mass to the extent of four inches, then inserted Kocher's director, and afterward forceps after the method of Hilton, and removed a piece of diseased lung for examination. He introduced a drachm of powdered iodoform into the centre of the tubercular mass and packed iodoform gauze into the lung as a plug.

This man improved wonderfully within a few hours. For several days after the treatment he spat up blood and particles of iodoform. Once or twice a week for a period of over five months a drachm of iodoform in powder or in emulsion was introduced into the diseased lung. Ferguson's patient was apparently cured.

Abscess of the Lung. Verneuil¹ says that an abscess of the lung should be treated by pneumotomy, and that the results are fair, especially if the abscess is one following typhoid fever. He resects portions of one or more ribs, does not raise up any large flap from the chest-wall, and thinks that the removal of the ribs gives freer access and better drainage.

Jacobson² maintains that the prognosis in abscess of the lung depends to a very great degree upon the nature of the perforation into a bronchus, and that the most favorable prognosis can be made when there is a large opening into a bronchus, with free drainage. In some cases there is a serous or purulent pleuritic effusion, but he does not think that either of these conditions materially adds to the dangers of the case. He believes that acute cases should be treated by pneumotomy, and that the best results are obtained from that procedure when the pus is just under or near to the visceral layer of the pleura.

My observation has been that even those supposed to be the most skilled in the interpretation of physical signs are frequently misled as to the real situation of an abscess of the lung, and that the surgeon may operate and utterly fail to find it. The X-rays, however, afford us a valuable means of localization. When we come to operate upon an abscess of the lung, if adhesions do not exist it is better to suture the two layers of the pleura together. We can then wait for the formation of adhesions. Some surgeons, however, do not wait, but proceed at once after suturing.

Charles A. Morton³ reports a case in which he resected a portion of a rib, opened the pleura, and found no adhesions existing. He then sutured the lung to the parietal pleura and proceeded at once to open

¹ *Annales de la Société Belge de Chirurgie*, June, 1900.

² *Zeitschrift für klin. Med.*, 1900, Nos. 3 and 4. ;

³ *British Medical Journal*, February 17, 1900.

the abscess and insert a drainage-tube. He packed a mass of gauze around the tube. This patient recovered, and there was no evidence of the occurrence of any pleural infection.

A. Pearce Gould¹ discusses the surgical treatment of pulmonary abscess, and says that it is difficult to localize the abscess. The sign upon which diagnosticians chiefly rely is the finding of moist râles, but Gould cautions us to remember that the distinctness with which moist râles are audible depends more upon the conductivity to sound of the tissues which intervene than upon the nearness of the cavity to the end of the stethoscope. The surgeon must find the cavity before he opens it, and after the patient is chloroformed he should mark out on the chest the area where the physical signs are most evident. Under no circumstances must the patient be turned upon his sound side, as that would permit infected matter to flow into the trachea and from there into the sound lung, might produce instant death, and at least will be usually followed by septic bronchopneumonia.

Gould introduces the exploring needle into the lung, and as soon as purulent matter escapes holds the instrument in place to serve as a guide. He says that it may be necessary to introduce the needle in several directions and in several different places before the abscess is discovered. After discovering the abscess he removes a portion of one of the ribs and incises the parietal pleura, and if this is found adherent to the visceral pleura he passes a straight, narrow bistoury into the abscess cavity alongside of the needle. Alongside of the knife he introduces a pair of dressing forceps, and then opens the forceps gently and withdraws them. The position of the patient allows the pus to flow out, and the cavity may be wiped, but must have no fluid whatever introduced into it. A rubber drainage-tube is then inserted into the cavity, and is left in place until the cavity becomes a mere sinus.

The same author¹ points out that if the two layers of the pleura are not adherent after the opening is made the surgeon should introduce his finger and feel about to see whether there is an adjacent adherent area. If he discovers that there is he should close the first incision and make a second one in the region of the significant adhesions; but if there are no adhesions the lung must be grasped with forceps and the parietal pleura must be sutured to the visceral pleura.

Gould thinks that the safest plan is to carefully observe the direction and length of the exploring needle, and then to remove the needle, stuff the wound with gauze, and to wait twenty-four or forty-eight hours before going on with the operation; but if the conditions forbid delay the abscess can be opened immediately after suturing without much

¹ Practitioner, February, 1900.

² Ibid.

danger of infecting the pleura. Gould likewise tells us that we should have plenty of room for this operation, and that, if necessary, portions of two ribs should be removed.

Gangrene of the Lung. Verneuil¹ says that the results of operation in gangrene of the lung are good, particularly if dealing with a local gangrene which follows an acute inflammation. He points out that when medical treatment alone is used the mortality is 80 per cent., and that when surgical treatment is employed it is about 40 per cent. As in the case of an abscess, pleural adhesions usually exist; but if they do not the surgeon should create them. He maintains that after the cavity has been incised it should be scraped or cauterized before it is drained, but he opposes irrigation.

Gould² says that when the cavity is opened sloughing material may be at once spontaneously ejected, or the surgeon may be able to extract it with forceps. The method of operation is exactly similar to that employed in abscess of the lung.

A. H. Levings³ reports two successful cases of operation for gangrene of the lung.

Lenhardt⁴ reported four cases of gangrene of the lung cured by rib resection and pneumonotomy.

Bronchiectatic Cavities. Verneuil⁵ points out that when there is but a single sac-like cavity, the operation often greatly improves the condition, but it rarely effects a cure, and there is a high mortality following it. It should not be employed if there are multiple cavities or if the general condition of the patient is bad.

PERICARDIUM AND HEART.

Purulent Pericarditis. Puncture is a very unsatisfactory method of treating purulent pericarditis. It does not afford good drainage, does not enable the surgeon to remove fibrinous masses, and will not produce cure. To treat purulent pericarditis by tapping is as unsatisfactory as to treat empyema by tapping, and the procedure itself is very dangerous. The relations of the pleura and pericardium to the chest-wall vary, and there is much risk of wounding either the heart or the pleura. In fact, as Brentano pointed out, there is no surface area through which it is always safe to insert the needle. Further, it has been determined by Brentano, Rehn, and Riedel that a pericardial effu-

¹ *Annales de la Soc. Belge de Chir.*, June, 1900.

² *Practitioner*, February, 1900.

³ *New York Medical Journal*, October (or August) 14, 1899.

⁴ *Deutsche med. Wochenschr.*, November 2, 1899.

⁵ *Annales de la Société Belge de Chirurgie*, June, 1900.

sion does not push the heart backward, but lifts it forward toward the chest-wall, and the deduction is that in tapping there is great danger of puncturing the heart. A collection of purulent fluid in the pericardial sac should be treated as is a collection of purulent fluid anywhere else—*i. e.*, by incision and drainage.

Simple incision, without resection of a portion of a rib or a rib cartilage, is dangerous. The internal mammary artery may be divided or the pleura may be opened, and very little room is afforded to tie the divided vessel, to close an opened pleura, or to find and drain the pericardial sac. The pericardium should be exposed by resecting the cartilage of the fifth rib or by resecting a portion of the fifth rib itself, or it may be approached from below the diaphragm, as recommended by Ogle and Allingham.¹ After the pericardium has been exposed it should be incised, and irrigation with salt solution should be practised in order to remove fibrinous masses, which contain numbers of bacteria and quantities of toxin. The edges of the wound in the pericardium should be sutured to the margins of the skin wound. The operation can be carried out under local anæsthesia.

Dr. Howard Lilienthal² presented before the New York Academy of Medicine a case of purulent pericarditis successfully opened and drained. The patient was a Russian, aged fifteen years, who when admitted to the hospital was thought to be suffering from pneumonia of both lungs. A week after admission the respirations became very rapid; the next day a pericardial friction sound was detected; two days later there were the physical signs of effusion, and streptococci were discovered in the expectoration. The symptoms remitted for about ten days, when the pericardial friction sound reappeared, and ten days later he had become much worse. The pericardial sac was aspirated and 18½ ounces of pus were withdrawn. From this pus pure cultures of pneumococci were obtained.

As the patient did not improve, it was decided to open the pericardium. Local anæsthesia by eucaine B. was employed. An incision was begun in the third intercostal space, about one-quarter of an inch to the left of the margin of the sternum, and was taken downward to the fifth intercostal space; it was then projected in the form of an "L" toward the nipple. Three-fourths of an inch of the costal cartilage was removed. The pericardium was extremely thick. When it was incised a quantity of pus flowed out, and for some little time pus was expelled by the movements of respiration and coughing. A drainage-tube was inserted, but it blocked against the heart, and it was thought that this might produce erosion or reflex trouble, so the wound

¹ Lancet, March 10, 1900.

² Medical News, November 25, 1899.

was simply left open without artificial drainage. Irrigation with normal salt solution was practised a number of times. The patient, Lilienthal says, is now in an admirable condition, although, of course, some adhesions exist; but these, it seems likely, will be gradually torn loose as he grows up, and the probability is that he will eventually have a sound heart.

C. A. Ljunggren¹ reports a case of suppurative pericarditis which recovered after incision and drainage. The author discusses the general subject and considers the relative merits of different methods of treatment. He condemns as dangerous and unreliable the operation of puncture. He adds six cases to the list of thirty-five collected three years ago by Roberts. In this series of cases sixteen recovered and twenty-five died. He says that seven of the fatal cases perished either from faulty technique or great prolongation of the operation. The author lays down the following rules of procedure in such conditions:

A considerable opening should be made in the pericardium, so as to enable the surgeon to obtain a view of the contents of the sac. Fibrinous masses should be removed and drainage should be obtained by the use of two large-sized drainage-tubes. He makes the incision in order to give thorough evacuation of pus and to allow of drainage of the posterior portion of the pericardial sac without embarrassing the cardiac movements; it should be so placed as to lie within the normal boundaries of the pericardium after the latter has been opened and has retracted. He says that it is necessary to protect the pleural cavity from infection by pericardial pus. In order to avoid injuring the pleura, the incision should be kept within the zone of absolute dulness. In some cases it is impossible to avoid the mammary vessels; in such a case they ought to be ligated before they are cut. He cautions the surgeon who opens the pericardium to avoid injuring the heart. He thinks that in weakened patients a general anæsthetic should not be given.

The operation which Ljunggren advocates is the resection of a portion of the fifth rib in the left mammary line, aided in some cases by removal of the sternal end of the sixth costal cartilage. He separates the pleura by blunt dissection and sutures it to the wound in the chest-wall. The author asserts that he agrees with Roberts, that the operation should be performed as soon as the diagnosis is made.

Cyril Ogle and Herbert Allingham² report a case of purulent pericarditis which was operated upon, the method practised being the removal of the fifth costal cartilage of the left side. This patient died fourteen days after the operation. The authors think that a better way of

¹ Abstract in the *Annals of Surgery*, November, 1899, from *Nord. med. Ark.*, new series, 1899, vol. ix., No. 28.

² *Lancet*, March 10, 1900.

approaching the heart than that formerly employed would be from below, through the diaphragm. When an incision of this sort is made a sponge on a holder can be introduced into the pericardial sac, can be carried around the entire heart, front and back, and can be used to detach and remove masses of adherent lymph. Masses of lymph are difficult to remove in the ordinary operation; they often block the drainage-tube, and greatly impede the action of the heart. The authors have never performed this operation on a living person, but have repeatedly practised it on the dead body, and they have satisfied themselves that it is not only feasible, but easy. The best plan appears to be to make an incision about three inches in length, the upper end of the incision being at the costoxiphoid angle and the incision passing along the inferior margin of the seventh left costal cartilage. The cartilage is exposed by separating the abdominal muscles over it; it is then lifted out and upward. This retraction will expose the fibres of the diaphragm and also the cellular interval between the diaphragm attachments to the cartilage and to the xiphoid appendix. The cellular interval between these two points of diaphragmatic attachment should be torn through, when a mass of fat will become visible in the space between the pericardium behind, the sternum in front, and the diaphragm below. This fat—and with it the diaphragm—is pulled downward, when the pericardium becomes visible and can be incised at its lowest part in front, and a finger can be inserted to explore the heart, front and back, almost to the base. During this operation a slight extent of peritoneum may be exposed; it is not injured, but is simply pushed aside, as is done in the operation of suprapubic cystotomy. The superior epigastric artery is well inside the incision, toward the middle line.

Charles B. Porter¹ says that there are three methods of operating which probably have all been practised or advised: trephining the sternum, incision through an intercostal space, and epigastric incision; but he does not approve of any one of them, because of the danger of damaging the pleura or the diaphragm. We should do an operation which will not open the pleural sac, but which will open the pericardium at the most dependent point and at a point which will be the most dependent even after the sac has contracted. He thinks that this point is best obtained by resecting the fifth costal cartilage. After the cartilage has been resected the internal mammary vessels are sutured firmly, are tied in two places, and are divided. The pericardium is exposed by blunt dissection. Porter proves the diagnosis by inserting a needle into the exposed pericardium, and then opens the sac by an incision which passes downward and outward. Finally he stitches the pericar-

¹ Boston Medical and Surgical Journal, October 18, 1900.

dium to the soft parts of the chest-wall. He advises irrigation to remove fibrinous masses, and drainage by means of two rubber tubes, one just entering into the pericardial sac and the other passing almost to the bottom of it. When the discharge begins to diminish one tube should be withdrawn, and later the other should be removed and be replaced by a strand of gauze. During all this time the pericardial sac should be irrigated daily with salt solution. The operation of pericardotomy, Porter maintains, is indicated in every case of suppurative pericarditis.

Wounds of the Heart. We reviewed this subject at some length last year. The trend of opinion seems stronger than ever in favor of operation in these cases—cases which hitherto have been abandoned to death while the surgeon stood helplessly by and with infinite care did nothing. We have passed far beyond the point of view of Billroth, who said that no surgeon who wished to preserve the respect of his colleagues would ever attempt to suture a wound of the heart.¹ The *Philadelphia Medical Journal* (September 30, 1899) truly said that the reported cases in which surgical interference was practised teach us, “as in so many other conditions demanding surgical treatment, bold and prompt intervention offers the only hope.” The same journal declares that the motto of every modern surgeon ought to be “L’audace, plus de l’audace, toujours plus de l’audace.”

The subject of wounds of the heart is admirably reviewed by Martin W. Ware,² and he discusses the reports of Nini, Rydygier, Giordano, Elsberg, Podrez, Loison, and Terrier and Reymond. These reports were considered by us in PROGRESSIVE MEDICINE last year. An article of great importance has been contributed by Charles A. Elsberg.³ It is called “An Experimental Investigation of the Treatment of Wounds of the Heart by Means of Suture of the Heart Muscle,” and is a most thorough and instructive presentation of all that is known about the subject, with much original matter obtained by personally performed experiments. The history of the subject, including the reported cases and the notable articles, is of the utmost value. Elsberg discusses the cause of death after heart injuries, and points out that whereas tapping or pericardotomy in the treatment of a heart injury in which the pleural sac is filled with blood has a rational basis, there is great risk in its performance, because when pressure has been removed from the heart the hemorrhage is apt to begin afresh, or, if it had not ceased, to become much worse. For these reasons it is necessary for the surgeon to find a more efficient method of arresting hemorrhage from a wound of the heart, and this is found in suture.

¹ Journal of Experimental Medicine, September and November, 1899.

² Annals of Surgery, October, 1899.

³ Journal of Experimental Medicine, September and November, 1899.

Suture of the heart was first proved to be feasible by experiments upon animals. Elsberg says that up to the time his article was written the heart in human beings had been sutured in nine cases. Four of these patients recovered, one died of pneumonia a week after the operation, one died of empyema nineteen days after operation, one of shock before the completion of the operation, and two lived for two days and then died, death in one of these cases being due to secondary hemorrhage from a coronary artery, and in the other to exhaustion.

The author then reports in detail his experimental studies on animals. He observed that it was possible to tie a ligature transversely around a portion of the ventricle and yet only temporarily disturb the action of the heart. When the ventricle is so tied off a large incision may be made into a ventricular cavity, without the occurrence of hemorrhage. He made experiments to throw light on a great many doubtful points: The question of hemorrhage, in what sort of wounds it is worst and in what sort least; the effect of suturing the intact wall of the heart; the result of wounds when sutures are not employed; the effects of suturing wounds, the number of sutures that may be applied without interfering with functional activity, and the methods to be followed. He made a study of large wounds, the methods of suturing, and the histological changes that occur in the process of healing. His conclusions are as follows: (1) Suture of a cardiac wound as a last resort is an operation which is often justifiable; (2) suture of a wound of the heart is not liable to cause sudden arrest of cardiac action due to the manipulation unless Kronecker's co-ordination centre is injured; (3) the suture should in most cases be interrupted and of silk. The epicardium and superficial layers of the myocardium should be the only ones penetrated by the suture, and the suture should be tightened during diastole if possible. (4) It is not possible to give stated indications as to the cases which are operable or as to the time when operation should be performed; each case must be considered by itself for symptoms which justify operative interference. The above-quoted article of Elsberg's is an original study of great importance and should be read in full.

THE BREAST.

In order to successfully treat carcinoma of the breast, early diagnosis of the disease is of the first importance. Cases that are operated on late, when there is very extensive glandular involvement, are almost certain to recur. The best statistics are obtained from cases operated upon at an early period of the disease, and it becomes the duty of every teacher to impress upon the minds of his students the necessity for early diag-

nosis and the responsibility which rests upon the family physician. Probably 90 per cent. of mammary neoplasms are malignant; every tumor of the mammary gland should, therefore, be looked upon with suspicion, and it is never proper for the family physician to offer the suggestion that the tumor should be let alone or that the patient should await developments; yet in very many cases in which the disease is not seen by the surgeon until it has become wide-spread or perhaps inoperable the family physician is wrongly blamed, and careful inquiry will elicit the fact that for months the patient has hidden her affliction, not only from her medical adviser, but from her own family. It must be within the experience of every surgeon that patients with malignant disease of the breast occasionally present themselves, who on being questioned admit that they have come privately and that their family physician knows nothing of their condition.

Dr. William L. Rodman¹ has written an article dwelling upon the necessity for early diagnosis and operation in tumors of the mammary gland. He points out that cancer is increasing at a rapid rate, and alludes to the remarkable prophecy of Dr. Roswell Park, which is quoted later in this section (see Sir William Banks on "Cancer of the Breast," page 105).

Rodman insists upon the fact that the chances in every tumor of the breast are ten to one in favor of malignancy; therefore, the advice so often given to women, to wait and see whether a tumor is or is not malignant, is unjustifiable, and would be justifiable only on the ground that a surgical operation would be more dangerous than the disease itself; but such is not the case.

Rodman dwells upon the methods of diagnosis and points out the form of case which he thinks is most apt and the one which is least apt to be permanently relieved by operation. He says, most properly, that internal metastasis is a positive contraindication to radical operative measures. He thinks that too many operations are done in advanced cases, and that the proof of this is shown by the fact that in many of them death takes place in from six months to a year after the operation; yet in these very cases there probably was no local recurrence, the only explanation being that secondary deposits had taken place before the removal of the primary growth. Rodman believes it to be a good plan in performing operations for supposed cancer of the breast, especially if the diagnosis is doubtful, to have a capable microscopist present during the operation, as he can in fifteen minutes give a reliable opinion as to the nature of the growth if a small portion from near its centre is given him.

¹ Philadelphia Medical Journal, October 22, 1899.

If the tumor is found to be malignant it should be radically removed but if it is benign only the tumor and its capsule need to be extirpated. Rodman affirms—and, we think, very justly—that whereas the microscope is very valuable, a carefully made clinical diagnosis is decidedly more reliable.

Rodman reserves Halsted's operation for advanced cases, and does not think that it interferes with the future usefulness of the arm. He is not convinced that it is better to enter the neck in every case. He feels assured that an early operation will cure half of the cases operated upon, but that as long as the present conditions obtain—taking cases as they come—we need not expect to cure more than one-third of them.

A most instructive review on the subject of carcinoma of the breast will be found in the *Bristol Medico-Chirurgical Journal* for December, 1899, from the pen of W. M. Barclay. He particularly reviews the work of Stiles, Marmaduke Sheild, Watson Cheyne, Halsted, and Willy Meyer, and dwells somewhat upon Halsted's contribution relating to adenocarcinoma—a condition less malignant than the ordinary carcinoma, which occurred five or six times in Halsted's 150 cases.

Sir William Banks was one of the earliest to recommend a radical operation. He and the younger Gross were pioneers in sustaining the views of Moore, of London. It is, therefore, with peculiar interest that we read the Lettsomian Lectures by Sir William Banks,¹ which he designates "Practical Observations on Cancer of the Breast." In these lectures will be found the results of his experience for thirty-three years. He remarks that whereas he produces impressions rather than statistics, he is persuaded that nothing can be more lying and delusive than statistics if not properly used. He reviews the local distribution of cancer and cause of the increasing death-rate from the disease, and dwells particularly upon the paramount importance of early diagnosis. He says very many errors are committed in this matter; yet we all recognize that the smaller the amount of the disease the better the chances of operation, and early diagnosis enables us to operate when there is but a small amount of disease, and if this fact can be permanently crammed into the minds of students and practitioners a great improvement in operative results will be sure to follow. There is much of practical wisdom in Banks' statement that the real line of improvement lies in this direction and not in inventing extravagant operations for cases that are even past praying for. Of course, as he says, in the very earliest stage of a mammary cancer no one can make a positive diagnosis; but, as a matter of fact, it seems to be a common thing for a patient to

¹ British Medical Journal, March 10, 1900.

go to a general practitioner and show him a lump in the breast, and for him to make light of the matter and talk about "a swollen gland," in order to avoid frightening her. Banks says that he has come to know quite well a phrase that has cost a number of lives—*i. e.*, "If it does not bother you, do not bother it." This is most unfortunate advice, for the patient goes home; the lump grows larger, but she does not become alarmed about it, until finally it develops to such an extent that she does become frightened; then she goes to the doctor; there is a distressing scene, and they both go to the surgeon. The surgeon thinks that he may be able to entirely remove the disease, but is by no means sure. Banks impressively implores his brothers in general practice to cease regarding any lump in the breast, however small it may be, as of no importance. He argues that as a strangulated hernia is always operated upon if it does not go back, so a lump in the breast ought always to be operated upon if it does not disappear. Banks then considers the relation of heredity, constitution, and traumatism to the development of cancer. He is by no means convinced of the infective nature of cancer, and says that up to the present time there is no clear and positive proof of it; but one must remember that there is a possibility of infection, and we must be open to conviction by the evidence which may in future be offered on the subject, should make careful experiments, and should industriously collect facts.

Banks states that in 1877 he began to practice thorough removal of the breast and also the extirpation of the axillary glands, and that these opinions were indorsed by the younger Gross in 1880. He very much objects to the profession maintaining that the modern operation for cancer of the breast has come from the labors of Heidenhain and Stiles. He fails to see anything particularly new in Halsted's operation except what he himself looks upon as superfluous, and he grows sarcastic in stating that it seems a pity that while he was about it Halsted did not also advise the extirpation of the liver and the lungs.

Arthur E. Barker¹ discusses the expectancy of life in cancer of the breast. He makes an analysis of the statistics of operations for cancer of the breast, and offers the following deductions:

An operation to succeed must be done early.

The skin of the breast, the subcutaneous fat, the pectoral fascia, the fat of the axilla, the axillary glands, and the entire breast must be removed.

During the operation the surgeon should avoid cutting through carcinomatous tissue; if he does cut through such tissue he should put aside the instrument and complete the operation with one that is sterile.

¹ Lancet, September 8, 1900.

Very little handling of the parts should take place, and immediate bleeding should be arrested by forceps or by ligature and post-operative oozing by pressure and bandaging. The wound and the patient should have the benefit of rest for two weeks. In a fairly early case this extensive operation is accompanied by but little risk; but when the muscles have become infiltrated with cancer Barker maintains that cure will not follow operation, and the most operation will do in such cases is to palliate. It is questionable whether a very extensive operation, involving much risk from shock, is justifiable when we realize that at the best it can only palliate. Barker follows the apparently paradoxical rule that the more localized the primary region of carcinoma the more wide-spread ought the excision to be, because in such a case there is a fair prospect of cure, and when there is a fair chance of effecting a cure, we are justified in doing a most radical operation, even if it does produce shock. The converse of this rule has much to recommend it, viz., the more wide-spread the disease the more should the surgeon keep palliation in view, and the more should he limit his operation in order to avoid excessive shock.

Barker's figures indicate that over 33 per cent. of cases live more than three years after the operation; but it is not proper to call all these cases cured, as many of them die later from cancer, rather, it should be noted, from growth in internal regions than from local recurrence.

Abbe¹ has during the past fifteen years operated upon 123 cases for cancer of the breast, and there has not been a single death. Thirty-three of these were private patients, and he has very recently heard from eighteen of them. One lived six years; 1, five and a half years; 4, four years; 3, three years; 5, two and a half years; and 4, one and a half years. It will thus be seen that about one-fourth of them have reached the three-year limit. When an operator has had even a few cases pass the three-year limit he becomes convinced of the value of radical work, and is then sure that cancer is at first local and manageable. Abbe says that even if recurrence takes place after operation we ought not to be hopeless and discouraged, because if it be promptly and thoroughly eradicated there is still a reasonably good prospect of effecting a cure. Of course, a recurrence is not a new outbreak of the disease, but is the growth of minute metastatic areas left unremoved by the operation. Abbe further shows that besides its greater tendency to produce cure, clearing out the axilla possesses the following advantages: The growth of glands in the axilla, if allowed to continue, will cause edema of the arm and excessive neuralgia, and operation prevents this;

¹ Medical News, April 7, 1900.

this operation also prevents cachexia, which is now not commonly seen even when recurrence takes place.

It seems probable that cancer is increasing, and if this is true of cancer in general, it is likely that cancer of the breast is becoming more frequent. This increase in cancer is indicated by statistics. Sir William Banks¹ says that, apart from statistical information, his own impression is to the same effect. He admits, of course, that a surgeon's impression must be received with care, and that, naturally, as a man's practice increases he may see more of certain cases than he used to do, and may come to think that the same thing is happening to everybody else, and that there is a general increase in a disease when the increase is really only in his own sphere of observation. In endeavoring to prevent himself from falling into this error Banks recalls the years during which he was dresser for Mr. Syme, who was indisputably the first surgeon in Scotland in his day and to whom the pick of the surgical cases of the south of Scotland were sent. Cases of cancer, although not uncommon, were rare compared with the number that Sir William Banks himself sees at the present time, and they were objects of curiosity and interest to students. A statement like the one quoted above is more than a mere impression; it is a fact.

Some surgeons dispute the increase of cancer, maintain that it is apparent rather than real, and that the apparent increase chiefly arises from improved diagnostic methods, which lead to greater accuracy in the assignment of causes of death; from the greater frequency of post-mortem examinations now than formerly; and in the third place, we may add, from the frequent performance of exploratory operations, which often enable the surgeon to make a diagnosis. Banks does not, however, believe that improved diagnosis and more numerous autopsies can account for more than a portion of the apparent increase in cancer mortality, and he calls attention to a paper by Prof. Roswell Park, who stated that in England and Wales the cancer death-rate has risen from 1 out of 5646 of the population in 1840 to 1 out of 1306 in 1890. He also quotes the following remarkable statement of Roswell Park, to which we previously referred, that if in the next ten years the increase in cancer mortality is maintained in New York State we shall find that at the end of that time there will be more deaths from cancer in that State than from consumption, smallpox, and typhoid fever combined.

Banks also refers to the article of Dr. Neusholme² disputing the reality of the great increase in cancer. Dr. Neusholme maintains that the apparent increase is due to the greater accuracy of death certificates at

¹ British Medical Journal, March 10, 1900.

² Practitioner, April, 1899.

the present time, and shows that a considerable number of deaths are still returned with indefinite headings, but that the proportion in which this occurs diminishes year by year, and the returns are becoming more and more accurate. He says that if we follow the statistical method which is usually adopted to prove an increase of cancer we can, on similar lines, prove, what is not true, that the number of persons who die each year of old age has enormously decreased. The latter "false fact" appears, because deaths which were formerly returned as caused by old age now have the real cause assigned to them. Neusholme thinks that the increase in the death-rate from cancer is at least one-half or one-third less than it appears to be from a study of the death returns.

We are forced to agree with Mr. Gilbert Barling,¹ who states that it is impossible to positively say whether or not cancer is absolutely increasing. He is inclined to accept the view that the increase is, in the main, rather apparent than real.

If we hope to cure cancer of the breast, practically all surgeons agree that an extensive primary operation is necessary—what is known as the complete operation—*i. e.*, the removal not only of the primary cancer, but also associated lymphatic glands, whether enlarged or not, and of the lymphatic vessels and the minute glands which lie between these two foci. As we have before stated, it is not proper to assume that glands are free from disease because they are neither enlarged nor indurated; for, as Mr. Stiles has said, lymphatic infection takes place by embolism, and in the earliest stage of cancer of a lymphatic gland there is neither enlargement nor induration.

The most radical of the operations advised is that of Halsted. Mr. Cheyne does not agree with Halsted that it is always advisable to remove the lymphatic glands from above the clavicle. After exposing the sheath of the axillary vein some surgeons leave the sheath in place; but we think that the sheath of the axillary vein ought always to be removed. We also agree with Cheyne that the fascia should be removed from over the serratus muscle, and some of the fibres of the muscle itself should be taken away. It is probably likewise advisable not only to remove the sheath of the axillary vein, but also to remove some of the branches of the vein from the walls of the chest, because lymphatics travel along with these smaller veins, and complete removal of the former is impossible without removal of the latter.

The operation should be extensive and thorough, and, as is pointed out in the *Medical News* of September 23, 1899, recent operative work in mammary cancer has positively shown that upon the first operation depends the future of the case, and that the operations which are per-

¹ British Medical Journal, November 25, 1899.

formed for the removal of areas of recurrence are in the great majority of instances only palliative. Anything less than radical extirpation of the primary growth should, in Mr. Watson Cheyne's words, be designated "an incomplete operation."

Mr. Gilbert Barling¹ favors Halsted's operation. One objection to the Halsted operation is that it leaves a large gap which cannot be closed by suturing, and that if something is not done with this area a number of weeks will be required for the wound to heal. Surgically this is of little importance, but it is of decided importance to the patient. Halsted at once transfers Thiersch grafts, cutting them from the front of the thigh. Gilbert Barling² advocates the use of these grafts, but cuts them from the deltoid area of the same side, each piece being nearly an inch wide and from one to three inches in length. Barling says that there is one drawback to grafting, and that is the time which it takes—about fifteen minutes—and in every case we must decide by the condition of the patient whether or not it shall be immediately performed.

Another method of closing the wound is that devised by Assaky. He makes an incision above and another below the opposite mammary gland, dissects this gland from the muscle beneath it and pulls it over, so as to fill up the space left by the removal of the breast of the opposite side. He then sutures the sound breast in its new position. This procedure brings the nipple to about the centre of the chest. The flap is well nourished by branches of the axillary artery, although there seems to be some tendency for it to slough at the distal margin. In one case in which this procedure was followed I observed a moderate amount of sloughing. Maiss³ has recently advocated Assaky's method.

In estimating when a case is cured we are still apt to follow the rule of Volkmann and claim that a cure has taken place when there is no evidence of recurrence three years after the operation. Beyond any doubt, however, in some cases in which there is neither regional nor local recurrence there are internal growths; and even in the people that have passed the three-year limit the mortality during the next few years is greater than among persons of corresponding ages who are not cancerous. As the *Medical News* of December 16, 1899, says, there are many exceptions to Volkmann's rule, and cases of regional recurrence are frequently noted after four years or even longer. In Barker's list of ninety cases operated on five deaths from recurrence have taken place beyond five years after the operation, and one of these patients had lived seven years and eight months. It therefore becomes certain that even when a woman is alive and apparently well five years after the operation she may still die of cancer. The *Medical News* of De-

¹ British Medical Journal, November 25, 1899.

² Ibid.

³ Münchener medicinische Wochenschrift, October 3, 1900.

cember 16, 1899, points out that out of Barker's ninety patients only two have lived ten years since the operation, and that in one of these a lump has been present for three years; the other patient, who was alive over eleven years after the operation, was in a similar condition. Of course, some cases of supposed late recurrence may in reality have taken place within three years and not have been discovered until later. As Warren has said, after an operation for cancer a woman should be examined by a surgeon at intervals during a course of years.

The question of late recurrence is of extreme importance, and on it hangs the reality of the claims as to the curability of cancer. Some maintain that late recurrence is an evidence of the parasitic theory, the parasite having remained latent for a considerable time; others assert that like recurrence indicates that cancer is, after all, a general disease with a local lesion. It is, therefore, of the first importance that cases operated upon by modern radical methods should be traced and followed for many years. There is no question that the radical operation, in the majority of patients, greatly prolongs life and greatly adds to the comfort of the individual; but, unfortunately, it seems probable that some of the patients supposed to be cured—patients, in other words, who have passed the three-year limit—subsequently die of cancer in some portion of the body.

When a cancerous growth has recurred and is thought to be inoperable, or when a primary growth is regarded as inoperable, it seems to be proved that in a certain limited number of cases great benefit or possible cure may be obtained by oöphorectomy. How this benefit is produced is very doubtful. Some think the operation acts by leading to atrophy of the gland, and others that it acts by destroying the unfavorable influence which the ovary was exercising upon the breast.

As pointed out by Arthur Jackson,¹ an argument against both of these theories is the fact that after the breast has been entirely removed a recurrent scirrhus in the pectoral region may be greatly benefited by the operation; and we know that when the operation is performed it is the nodules in the subcutaneous tissue that first show signs of decrease in size. Jackson suggests the following theory: Oöphorectomy causes sudden flushings, and this extensive capillary dilatation may lead to benefit by bringing blood to the diseased area, the blood acting in a retarding manner upon the cancerous deposits or actually destroying them. This is in direct opposition to the common view, viz., that lessening or cutting off the blood-supply of a cancer retards its growth. Stanley Boyd² has collected 54 cases of mammary cancer in which oöphorectomy was performed. Nineteen were more or less benefited (35 per cent.); 34

¹ British Medical Journal, November 25, 1899.

² Ibid., October 20, 1900.

were slightly or not at all improved; 1 died of exhaustion. In 46 of the most carefully described cases 17 (37 per cent.) were markedly benefited, and in some of these cases all superficial disease disappeared. Boyd says that such statistics prove that atrophy is not accident or coincidence.

The improvement does not seem to be permanent; but, as Boyd points out, one year or even more of useful life may be gained. It is a very curious fact that oöphorectomy benefits some cases of breast cancer and not others, and does not benefit any cancer in any other region. Boyd reminds us that not even uterine cancers are not benefited, although oöphorectomy is followed by atrophy of the uterus, and he says there is a hitherto unsuspected difference between cancers. Boyd inquires: Why is it that all cancers of the mammary gland are not improved? He answers this query by saying that the difference must be in the cancers or in the ovaries. We cannot recognize the difference between cancers, neither can we between ovaries, even when removed. Boyd concludes that it is probable that certain ovaries furnish an altered internal secretion which favors the growth of cancer, either by stimulating epithelial proliferation or lessening the resistance to growth exercised by the tissues. Boyd¹ says that in a woman over forty years suffering from a cancer which is not very acute, and which is not associated with any visceral or bone lesion—a woman who is in fairly good general condition and before the menopause—the operation should be suggested for inoperable primary disease or inoperable recurrence, and in extensive primary disease and in recurrence not only should oöphorectomy be performed, but as much of the cancerous growth as can be removed safely should be taken away. We cannot promise a patient much, and in fact, as Boyd suggests, we should frankly tell the patient or her friends that the treatment is an experiment.

Some surgeons not only perform oöphorectomy, but also administer thyroid extract. Boyd does not give thyroid until satisfied that oöphorectomy has failed or that its beneficial effect is passing off.

In a very old person suffering from cancer of the breast the surgeon is often in doubt whether or not to operate. When this problem is presented to us the words of E. Harding Freeland¹ are to be borne in mind. He successfully operated upon a woman, aged eighty-two years, for a cancer of the left breast, and she recovered. He says that in thinking over the case at the time the following questions occurred to his mind: (1) Is it possible to remove the entire disease with a fair prospect of subsequent immunity? (2) If it is possible, is the patient able to withstand the shock of a prolonged surgical operation and the

¹ British Medical Journal, October 20, 1900.

² Lancet, June 2, 1900.

use of an anæsthetic? (3) If the two foregoing questions are answered negatively, what will be the subsequent history if the case is allowed to run its course? In other words, he weighed the risk of shock and the risk of recurrence after removal, with their consequences, against the certain increase of the tumor, the increase of the pain, and the inevitable eventual ulceration. He concluded: (1) That the complete removal of the disease necessitated an extensive operation, which would occupy a good deal of time and cause considerable shock; (2) that the patient was in fairly good health, of a hopeful disposition, and apparently possessed of fair powers of reaction for one of her age; (3) that the growth was rapidly increasing and the pain was as much as the patient could bear. He therefore decided that in spite of her advanced age it would be better to run the risk of operation than to condemn her to a short life of suffering and a miserable death. The author calls attention to a paper by Mr. T. Frederick Gardner,¹ in which the question of operation for cancer in the aged was discussed and in which the latter took the ground that it is justifiable.

SKULL AND BRAIN.

In former times operations on the skull and brain were apt to be very fatal, because when the dura was opened infection was extremely common. There has been a great change of view in modern surgery, arising from two factors: (1) Surgical cleanliness, and (2) the knowledge of cerebral localization.

As George Emerson Brewer² has said: "Two factors have recently led to a radical change of views on the subject of opening the cranial cavity for purposes of exploration. The first of these is the success which has attended the general employment of perfected aseptic surgical technique, and the second, the great advances which have been made by neurologists and physiologists in the localization of cerebral functions. As the advances in these two departments occurred simultaneously, it is not surprising that they led to an enormous increase in the boldness of surgeons in exploring the cranial cavity and to an unwarranted amount of sanguine expectation on the part of the neurologists, who looked forward to the possibility of relief in a large number of conditions which had formerly been regarded as hopeless or necessarily fatal. I think that I voice the sentiments of most surgeons of experience in this line of work when I say that up to the present time the results of exploratory cerebral surgery have been disappointing."

The comparative safety of some of these operations has, we fear, led

¹ *Lancet*, May 3, 1900.

² *Medical News*, December 23, 1899.

to the performance of some unnecessary ones ; in fact, it almost seems as if there has been a lessening of the sense of responsibility in dealing with brain cases ; and some surgeons have been led on, beckoned by the will-o'-the-wisp of a possible imaginary benefit, to operate freely upon idiots and also upon the insane.

The best results are obtained in the surgical treatment of traumatisms. The immediate effect of traumatism has been investigated by George W. Crile.¹ He demonstrates what Horsley pointed out, that the first effect of a head injury is respiratory failure, and that in a large proportion of the cases of gunshot wound there is sudden respiratory failure, the heart continuing to beat after the respiration ceases. According to Horsley and Crile, there is probably an indication for making artificial respirations at once after brain injuries, because the respiratory centre is very sensitive, and if artificial respirations are made for a time, natural breathing may be again begun. Crile also points out that we should bear in mind that when respiratory failure exists, natural respirations will be begun earlier if the blood pressure is increased ; hence, we should endeavor to increase the blood pressure even if it does not seem to be in a state of dangerous depression.

Many different conditions may result from a head injury. Brewer² names them as follows : Hemorrhage, contusion and laceration of the meninges or brain ; pressure from depressed bone or inflammatory exudate ; and secondary results such as abscesses, cysts, chronic meningitis, or cerebral softening. Brewer reminds us that when a patient survives the first shock, death does not commonly result directly from the lesion, but rather from an infection to which the nature of the injury predisposes ; and he concludes that when we recognize the possibility of infection the logical treatment is to make an exploratory operation, and in many cases to inaugurate measures to prevent or to antagonize sepsis.

Wounds of the Brain. A gunshot wound of the head when inflicted by the modern small-bore projectile gives a better prognosis than does a wound inflicted by a larger and softer bullet, although the favorable change in the mortality is less marked than is the case in wounds of the thorax, the abdomen, or the extremities. In the last *Report of the Surgeon-General of the U. S. Army*³ we are told that of 4243 cases of fracture of the skull noted during the Civil War, 2514, or 59.2 per cent., were fatal. In 1898 and 1899 there are records of 68 cases, with 37 deaths—a mortality of 54.4 per cent.

It is very generally maintained that a bullet wound from the modern military bullet is not directly infected. Tavel⁴ has recently made a

¹ Medical Record, February 17, 1900.

² Medical News, December 23, 1899.

³ Journal of the American Medical Association, November 17, 1900.

⁴ Revue de Chir., December, 1899.

study of the infection and the disinfection of gunshot wounds. He made numerous experiments in order to arrive at definite conclusions on these points. He apparently proves that microbes on a bullet are not destroyed by the heating which the projectile receives during the discharge nor by friction on the barrel, and that a bullet which is infected before firing is also infected when it strikes its mark. He further points out that a gunshot wound impairs tissue resistance for a considerable distance around it; and hence that infection of such a wound will take place from fewer organisms than would be necessary to infect a clean cut. He also thinks that the clothing contains germs, some of which the bullet may carry with it into the tissues.

It becomes obvious from the above-mentioned views that Tavel is not enthusiastic about the possibility of treating such wounds antiseptically, and he claims that the less done the better. He does not believe it possible to disinfect a gunshot wound, and is convinced that attempting to do so will only damage the tissues more and make them more than ever liable to infection. These pessimistic views of Tavel are not, however, shared by the majority of observers.

An interesting case has been reported by Mondol.¹ This patient had attempted suicide, firing three shots from a revolver, and one of the bullets had been found and taken away. Three years later amnesia and mental disturbance developed, and there was also some fever. A skiagraph which was taken exhibited a bullet in the brain. The patient became violently insane and was taken to the insane ward, but after a time was brought back; trephining was performed, and a bullet, which was lodged 5 cm. within the brain, was found and removed. This operation was performed three years and seven months after the original lodgement of the bullet, and the patient made a complete recovery.

The X-rays are of the greatest possible aid in locating bullets in the brain. Lucas² reports a case in which a revolver bullet, fragments of the bullet, and fragments of bone were located in the brain of a child, and were subsequently successfully removed. This child completely recovered without any paralysis at all.

Mr. Arthur E. Barker³ reports a case of gunshot wound of the brain through the mouth, in which the bullet was located by the X-rays and was successfully removed through the vertex on the sixty-ninth day, the patient making a complete recovery.

David Durran⁴ reports an interesting case of gunshot perforation of the brain followed by recovery. The bullet entered through the left parietal bone, passed through the brain, and emerged through the right

¹ *Revue de Chir.*, November, 1899.

² *British Medical Journal*, October 21, 1899.

³ *Lancet*, December 2, 1899.

⁴ *Ibid.*, August 14, 1900.

parietal bone two inches above and a little posterior to the external auditory meatus, and it lodged between the pericranium and the bone.

R. Stierlin¹ reports a case of gunshot wound of the skull in a man, aged thirty-four years, who committed suicide. The bullet grazed and somewhat comminuted the skull, and brain substance escaped from the wound. The man died two days after the infliction of the injury, and the post-mortem examination showed that the brain was extensively contused and that numerous splinters of bone had been driven through the brain substance. There was also fracture of the roof of each orbit and a contusion of the opposite temporal lobe. Stierlin has been able to find on record twenty-two cases in which fracture of the orbit has ensued upon skull injury. He thinks that it is due to the increase of internal pressure at the moment of the accident, which is sufficient to break the very thin bone that constitutes the orbital roof.

Not unusually after head injuries—for instance, gunshot wounds or compound fractures—there is a loss of brain substance; and it is astonishing how, when this happens, we will sometimes find no functional disturbance. A. Gutmann² has recently reported such a case. A boy's head was crushed between two carts and several portions of brain matter were squeezed out, one of them being as large as a walnut, and yet he recovered without any evidence at all of functional disturbance.

William Odell³ has recently reported the case of a child, aged sixteen months, whose head had been pierced with a carpenter's gouge. From the wound brain substance escaped every time the child cried. The wound was dressed antiseptically; there was no evidence of functional disturbance, and the child completely recovered.

Fractures of the Skull. Fractures of the skull are the most common injuries of the head with which the surgeon has to deal, and many serious problems are involved in these cases. There is such a liability to disaster after the infliction of a fracture of the skull that a great deal of judgment is often necessary in order to determine the proper preventive or curative treatment.

These injuries require the most careful study and the most watchful observation. As is well said by Silas C. Blaisdell,⁴ "That case which on its examination seems most grave may resolve itself into a case of simple concussion; and, again, that which appears simple at the outset may suddenly present the most serious aspects. No case of injury to the head can be treated with impunity, but the surgeon must use that eternal vigilance which is the price of so much other than liberty, else

¹ *Deutsche Zeitschrift f. Chir.*, April, 1900.

² *Centralblatt f. Chir.*, June 16, 1900.

³ *British Medical Journal*, March 24, 1900.

⁴ *Brooklyn Medical Journal*, April, 1900.

he will find himself minus his patient, who, while the surgeon rests in fancied security, seizes upon that moment to hie himself to that bourne whence no traveller returns."

Blaisdell maintains that when a positive diagnosis of fracture of the skull—simple, compound, or comminuted—has been established, and whether the patient has brain symptoms or not, the only advisable course is operative interference. I believe that this statement is entirely too radical; I would trephine in every case of compound fracture, in every simple fracture with marked depression in an adult, and in every fracture in which cerebral symptoms develop. In a simple fracture without depression and without cerebral symptoms I would not trephine, and the same statement applies to a simple fracture with slight depression and without cerebral symptoms. In a young child with simple depressed fracture in which cerebral symptoms are entirely absent it is by no means unusual to find the marked depression become a slight one or entirely pass away. Of course, in cases in which there is doubt the safest rule is to trephine.

Blaisdell truly says that these operations are not always as successful as we could wish, and that we must take into consideration the age and physical condition of the patient, the amount of shock, etc. He thinks that a vital point in the success of these operations is the condition of the surgeon and his assistants, and maintains, with entire justice, that trained assistants add very much to the chances of success. Any surgeon who has ever been obliged to operate far from home, with perfectly strange and often entirely incapable assistants, will appreciate the force of Blaisdell's contention that trained assistants aid incalculably in obtaining success, as they relieve the operator of a great deal of trouble, allow him to concentrate his mind upon what he is doing, and do what they should do promptly and without waiting to be directed.

There is no question that it is advisable to operate quickly upon the skull or brain if quick operation is consistent with thorough work, and it seems unfortunate that so many teachers and writers to-day would have us infer that it is really of very little moment how much time is spent in performing an operation. The longer the time the greater the shock; the more the tissues are handled the greater the liability to infection; the longer the wound is open the better the chance for the entrance of bacteria; the longer the patient remains under the influence of an anæsthetic the greater the subsequent depression; and it seems to have been well demonstrated that ether and chloroform distinctly lower the hæmoglobin in the blood and exercise a more or less harmful influence upon the corpuscles. All of these reasons seem conclusively in favor of rapid operation.

Blaisdell¹ says that all spiculae must be carefully removed, and that the opening through the skull must be large enough to insure the removal of all pressure from the brain; also, that each crack or fissure must be enlarged, traced to its end, and carefully inspected.

In the discussion upon Blaisdell's paper, which was read before the Medical Society of Kings County, J. P. Warbasse² delivered some valuable and instructive remarks. He commented favorably upon the rapidity of operation as practised by Blaisdell, and said that it is a new point to follow fractures to their utmost ramifications. He thinks, however, that a large class of fractures of the skull do not demand operation, and recover without it; and that if it is wise and good surgery to follow up a fracture which has been discovered in an operation, he cannot understand why the operator should not expose all fractures which are not compound.

In this matter surgeons have been governed by the idea of relieving compression due to hemorrhage; and if in a simple non-depressed fracture there is no intracranial oozing there seems to be no good reason for operating. Warbasse quoted the statistics of Phelps, showing that 50 per cent. of fractures of the base of the skull recover without operation, and yet there is no place where compression from oozing carries with it more danger. The speaker maintained that in a much larger proportion of cases of simple fractures of the vault recovery takes place without operation; if the policy of Blaisdell were followed the surgeon would, in a large percentage of fractures of the vault, have to pursue the fracture down to the base, since we know that the base is frequently involved in fractures of the vault. Warbasse regretted that Blaisdell did not explain more fully why this procedure is employed.

In Blaisdell's paper, above quoted, we find that he has frequently removed great quantities of bone. Warbasse is inclined to condemn this practice, because the operation is performed chiefly to relieve pressure, and when pressure is due to depression of bone it is usually relieved by elevation; and this has been the experience of most men who have attacked these injuries.

H. B. de la Tour, in discussing Blaisdell's paper, opposed the recommendation that fissures should be tracked to their termination; and he recorded his protest against it, maintaining that wherever the skull is penetrated and the dura exposed there is provided a point for adhesion of the dura either to the skull or to the scar—a condition which may be responsible for the subsequent development of epilepsy or other serious trouble. For the same reason he opposed the extensive removal of fragments of bone; he would remove all depressed fragments or splintered

¹ Brooklyn Medical Journal, April, 1900.

² Ibid.

fragments and all clots of blood, but he would not open to an unlimited extent various fissures.

A. T. Bristow, in the discussion, entirely concurred with Warbasse, and pointed out that in young children simple fractures rarely require any operation. Operation in such cases should not be done unless distinct symptoms arise; of course, in compound fractures in the young or the old operation ought to be performed. Bristow believes in elevating the depression rather than in removing large pieces of bone, and he thinks that in any case the indications for operation ought to be plain before the scalp is incised. Because of the somewhat cartilaginous condition of children's skulls they are not so liable as are those of older persons to fracture with depression and splintering of the inner table. Bristow has frequently observed distinct dents in the skull, which in a few weeks, or in less time, were elevated level with the surface.

In closing the discussion Blaisdell reiterated his proposition that elevation is not sufficient, and that if elevation alone is practised the throwing out of callus will often produce great mischief. He maintained that cracks should be followed up by the use of a special rongeur which takes away an eighth of an inch of the bone, and he denied that the instrument causes spiculæ to be cast off. He said that within two years the opening made by the rongeur would be filled up so as to be unrecognizable, and that he had never seen bad results follow the extensive removal of bone. In one case he removed a piece $4 \times 2\frac{1}{2}$ inches—practically the whole vault of the skull. The patient recovered, lived for four years, and eventually died of pneumonia. He denied that children's skulls are always soft and elastic, as he had often found when operating for microcephalus that the skull was like ivory.

The question of how to open the skull is of very great importance. George W. Crile¹ strongly advocates the use of the chisel. He says that when the skull is opened with a chisel and mallet, neither circulation nor respiration is appreciably affected. He uses an extremely sharp chisel, so as to be able to cut the bone with very light taps of the mallet, and says that he can thus enter the skull much more quickly than by the use of the trephine, and can regulate the size and shape of the opening. He thinks that opening the skull in this manner does not injure the brain by jarring. After the opening has been made it should be enlarged by sharp bone forceps, the most useful being the prismatically shaped forceps of Horsley.

Crile says that the hemorrhage from the diploë, while it is never dangerous, should be controlled or prevented, because it obscures the field

¹ Medical Record, February 17, 1900.

of operation. It can be stopped by pressing into the cut diploë a 10 per cent. solution of beeswax in sterile olive oil.

Blaisdell¹ maintains that a chisel should never be used, because it is clumsy and uncertain; it cannot be used rapidly, and if used by a mediocre operator it may produce great harm. He believes in the use of the rongeur, but thinks that if the bone is particularly dense the trephine may be used to make a series of openings, which may then be readily brought into one. He believes particularly in the rongeur, because it permits of such rapid work. He admits that in the hands of some surgeons excellent results have been obtained with the chisel, but asserts that these cases are exceptions and are not the rule, and that the success is due to the individual skill, dexterity, and deftness of touch of the operators. He opposes placing the mallet and chisel in the hands of those who are less skilful, as he thinks the amount of force applied by the mallet may produce bad results and may inflict serious damage on the delicate cells of the brain. As there is certainly a possibility of such damage, it would seem wiser for us to avoid such a method. Blaisdell says that no surgeon should teach the use of the chisel, because he cannot convey to the student the proper handling which is necessary to make it safe. He has seen one of the best surgeons in the country operate on a child, and with two blows of the mallet make a crack over four inches long. A blow with a mallet on a hard skull may crack it clear to the base.

Warbasse maintains that the use of the chisel is a clearly debatable question, and thinks that the theory on which Blaisdell opposes it is a valid one; as a matter of practical experience, however, the evil effects of the chisel are largely theoretical, and it is used by most operators. In fact, Warbasse asserts that the amount of concussion is comparatively small; but, of course, even this concussion is objectionable.

A. T. Bristow participated in the debate, and said he uses the chisel a great deal, and maintained that the rongeur is more apt to make spiculæ than is the chisel.

Dr. Browning, in the debate on Blaisdell's paper, strongly opposed the use of the chisel. He thinks that if pus is present the concussions might diffuse it; that if hemorrhage is taking place the blows might increase it, or, if hemorrhage has stopped, might start it afresh. Browning also believes that the strokes of the mallet are liable to damage the nerve tissue.

S. von Stein² describes an instrument which enables the surgeon to operate with great rapidity and without the slightest danger of damaging the dura. In order to make a trephine opening with this

¹ Brooklyn Medical Journal, April, 1900.

² Centralblatt f. Chir., May 12, 1900.

instrument it is necessary to expend but four minutes of time. The cutter has fastened near the upper end a protector; the lower end spreads out into a ring, which lies upon the skull when the hole has been bored deep enough. The protector turns as the saw turns, until a sufficient depth is obtained, when it is kept from going in deeper by the pressure of the ring upon the skull. This drill is then put aside and another is used, in which the cutting point slopes more abruptly and in which there is a round button at the tip. By adjustment of the protector the cutter enters more deeply, and the button on the tip will push the dura out of the way of the cutting edge. Stein says that it is not possible to injure the dura by the use of this instrument.

Epilepsy. A very large number of operations have been performed for epilepsy of traumatic origin and for focal epilepsy. Operations upon the skull and brain are only to be employed when the epilepsy results from direct irritation or from pressure upon the brain, whether that pressure is direct or indirect. There has been some difference of opinion as to the value of these operations, but the majority of surgeons have concluded that they are rarely curative; in fact, the results are usually distinctly disappointing.

George Emerson Brewer¹ says: "The consensus of opinion among neurologists and surgeons at present seems to be that such operations are indicated only in recent cases within one year after the injury, in cases in which general epilepsy has followed and in cases in which the attacks are of a purely focal or Jacksonian type, especially if an injury has preceded which corresponds to the motor centre presiding over the muscles that are the seat of convulsive movements. The reason that the operation does not give permanent relief in cases of long duration is explained by the theory that the epileptic habit has become established or that cortical degeneration has taken place, which relief of the superficial irritation does not remove. In those cases extensive cortical excisions have been suggested, but as yet the number of cases in which this has been done has been too small to give any positive results."

A. Lanz² reports two cases of cortical epilepsy upon which he operated. One patient was a woman, aged fifty-three years, who had been having epileptic attacks for two years and a half. Examination showed that there was some motor paresis of the left arm and leg, but sensation was entirely normal. The patient was in the hospital for a number of months, and during this time had nineteen attacks. The attack always began in the left toe, and spread upward, unconsciousness finally taking place. An osteoplastic flap was cut, and the dura was

¹ Medical News, December 23, 1899.

² Deutsche med. Wochenschrift, June 7, 1900.

opened, and the Rolandic region was exposed. The only detectable abnormal condition was an adhesion between the dura and the skull. The dura was sutured and the flap was replaced. During the four months succeeding the operation the patient had only two trivial attacks. This case of Lanz's emphasizes the well-recognized fact that occasionally an operation of any sort will temporarily relieve the epileptic habit.

The other case reported by Lanz was a woman, aged twenty-two years, who had been having attacks for six months. There was some motor paresis of the right hand, and when the patient bent her head forward she always became giddy. The attacks were frequent and violent, and began with contraction at the right side of the mouth or the right side of the face. An osteoplastic flap was turned down, the dura was opened, and the Rolandic and Sylvian regions were exposed. There were marked adhesions between the pia and the dura; at the lower portion of the central gyrus there was a well-marked area of disease, and there was a small region of softening a little above the Sylvian fissure. The diseased areas were extirpated and the adhesions were separated. For some weeks the patient had no attack, but two months after the operation attacks began again with their former frequency. The second of Lanz's cases illustrates the point that, although we may find the apparent cause and remove it, the benefit obtained is usually but temporary.

Of course, epileptic cases will be frequently operated upon in the future because an operation gives some chance of success; and if anti-syphilitic and dietetic treatment utterly fail we must always consider the question of operation. As Schar has said, "It is better to operate too frequently than too rarely." We agree with Schar's contention that the surgeon should examine an epileptic patient with the physician.

Charles D. Center¹ reports a case in which there had been multiple terminal-twig hemorrhage of the cortex of the right side of the brain, followed by transient left hemiplegia, petit mal, and latterly by generalized convulsions. When this patient was operated upon he had been in a state of coma, between two convulsions, for a couple of hours, so that it was not necessary to give an anæsthetic. A chisel was used to expose the dura, and on incising this membrane a considerable amount of bloody serum and particles of gray matter oozed out. The cortex was found disintegrated, and even upon a light touch with a piece of gauze portions of brain matter adhered. Multiple minute hemorrhages had taken place. The brain was aspirated in three directions without result, and the patient had five violent convulsions while on

¹ Philadelphia Medical Journal, November 17, 1900.

the table. The portion of the brain exposed was the middle and upper part of the right Rolandic region. A gauze drain was inserted and the wound was sutured and dressed. This patient came out of coma in a few hours and went on to uninterrupted recovery, although for thirty hours after the operation there was a profuse flow of bloody serum from the wound. Forty hours after the operation, on pulling out the gauze drain, a stream of clear serum shot up to a height of probably eight inches. Six weeks after the operation the man returned to his work, suffering no inconvenience, although his perceptive faculties are dull and he is indecisive and slow of speech and motion. The difficulty in this case was to make a diagnosis between epilepsy, cerebral hemorrhage, cerebral thrombosis, and uræmia.

In that large group of cases in which operation upon the skull and brain is out of the question it has been maintained by Jonnesco and others that we might cure the case by removing the cervical ganglia of the sympathetic. This operation has been performed in a number of cases of essential epilepsy. In 1893 Baracz proposed cutting the cervical sympathetic, and Jaboulay cut the sympathetic on both sides in 1895. Jonnesco, in 1896, removed the sympathetic ganglia for the cure of epilepsy. Jonnesco's theory is that epilepsy is due to anæmia of the brain, and by this operation a hyperæmic condition of the organ is induced, which hyperæmia increases cerebral nutrition and possibly produces cure. Marcel Hartwig¹ claims that the results of this operation, although not so gratifying as in Graves' disease and glaucoma, have not been unfavorable. He says that the final results of the operation are as follows: Up to February 11, 1899, forty-five cases had been operated upon; 55 per cent. were cured, 28 per cent. were improved, and 15 per cent. were not benefited. There were no deaths from the operation; but later six of the epileptics died. Hartwig calls attention to Déjérîe's criticism of Chipault's operations upon the sympathetic for epilepsy—a criticism which maintains that not a single genuine cure had been obtained in Paris.

Emory Lamphear² discusses the value of Jonnesco's operation. He says that some have long held that in epilepsy there is constant excitement of the vaso-dilators of the cervical sympathetic—a condition which causes chronic cerebral irritability. For this reason a number of patients were some years ago subjected to simple division of the cervical sympathetic. In some cases this produced marked benefit, which, however, was only temporary. The improvement, he says, probably passed away because the nerve fibres reunited. Lamphear believes

¹ Journal of the American Medical Association, July 7, 1900.

² Virginia Medical Semi-Monthly, November 10, 1899.

that there have been permanent cures resulting from the removal of the entire chain of ganglia on each side of the neck. It seems to us, however, that the operation is still a pure experiment, and that the Parisian results cast doubt upon its value in any case of genuine epilepsy. In all cases in which the disease has lasted four years or more the operation is regarded, even by its advocates, as hopeless. But few cases have been operated upon on this side of the water who have passed through a sufficient time since the operation to justify us in claiming that they are cured. Lamphear calls attention to this fact; he says that at least two years should elapse after the last paroxysm before the patient can be said to be cured. We would regard the five-year limit as safer and more accurate.

Deschamps¹ reports a case of epilepsy operated upon by Jonnesco's method. Only the superior cervical ganglia on each side were removed. One of these patients was a child with microcephalus who had previously had a linear craniotomy performed upon it; the other case was a boy of fifteen, who suffered from epileptic attacks supposed to have been originated by traumatism. These cases were both reported a few days after operation, and the author says that up to the time of the report they were apparently much benefited; but it is needless to say that a report made so soon after the operation conveys no real information as to the usefulness of the procedure. There is one point in the paper, however, that should be noted and remembered, and that is the statement that the operation is both difficult and dangerous, and that without great care the surgeon is liable to injure the carotid artery, the jugular vein, or the pneumogastric nerve.

Vidal¹ maintains that the resection of the cervical ganglia of the sympathetic is suited particularly to epilepsy of toxic origin, especially those cases in which cortical irritability exists, and also in ischæmia produced by stimulation of the cervical sympathetic caused by lesions in or near it. The object of the operation in these cases is to diminish irritation of the cortex—a condition which not only leads directly to convulsive seizures, but eventually produces permanent structural alterations in the motor cells. Vidal says that operation upon the sympathetic is useless in reflex epilepsy, in epilepsy produced by cerebral pressure, or in conditions caused by some poison which does not affect the bloodvessels or which dilates them. He suggests a method of determining the nature of the epilepsy by the administration of nitrite of amyl, and says that if this drug is given just as a seizure is coming on and it does not modify or arrest the attack he would conclude that

¹ *Gaz. méd. Belge*, 1899, No. 22.

² *Bull. de l'Académie de Méd. de Paris*, November 27, 1900.

circulatory disturbance is not the cause of the seizure, but that the attack results from reflex trouble or stimulation of the vaso-dilators. Hence, in such a case, as anæmia of the brain does not exist, operation upon the sympathetic would prove useless. The author asserts that a patient whose convulsion is affected favorably by nitrite of amyl is usually improved by operation upon the sympathetic, and he maintains that if the operation is performed early enough it may arrest the attacks and save the cortex from the degenerative changes which inevitably result from an insufficient blood-supply. He believes that if amyl nitrite produces a seizure the operation is positively contraindicated. These views are theoretical, and are not deduced from clinical observation.

Cysts and Tumors. Diller¹ writes an article upon brain tumors, and reports seventeen cases. The diagnosis was made in fifteen of these cases. He says that the conditions which most closely resemble brain tumor are Bright's disease, meningitis, abscess, and syphilis. One of the diagnosticated cases was dying when the author first saw him; the other fourteen were treated by very large doses of iodide of potassium (*i. e.*, from 300 to 400 grains a day), and if syphilis was suspected mercury was also given. In addition, symptomatic treatment was employed, *i. e.*, bromides, caffeine, acetanilid, tonics, electricity, etc. In three of the cases thus treated there was very distinct improvement, and in one case this improvement was maintained for almost six years. Diller, in common with most surgeons and neurologists, holds that potassium iodide in heroic doses will, not unusually, positively relieve the symptoms in a case of brain tumor, and that even tumors which are non-syphilitic in origin may be improved. He thinks that in some cases a portion of the mass may be absorbed, the balance remaining latent for a considerable period of time. He says that surgical operation may be performed to remove the tumor, for the purpose of making an exploration to find the tumor, with the idea of relieving headache, or to relieve optic neuritis; but that he would operate upon no case until iodide of potassium had been tried and had failed. He believes that the experiment with iodide should be continued for at least two months. If medical treatment fails, and the tumor has not been definitely located or has been located in a region inaccessible to surgery, and if the patient is suffering from violent headache, it is proper to trephine and incise the dura in order to relieve the headache and to improve the patient's vision; when, however, medical treatment has failed and the tumor is in an inaccessible region the difficulties and dangers should be explained to the family of the patient and an attempt should be made to surgically remove the tumor.

¹ Pennsylvania Medical Journal, February, 1900.

Schede¹ reports two cases of tumor of the cerebellum. In one case the symptoms indicated that the tumor was on the right side. An operation was performed, and a small, hard tumor was discovered on the surface of the left half of the cerebellum. It was enucleated with the finger, the dura was sutured, and the patient was greatly improved by the operation—the sight and hearing returning and the dizziness passing away. In the second case a cyst with smooth walls and about the size of a walnut was discovered near the median line. The cyst was opened and drained. The patient was much benefited, but a permanent cure was not looked for, on account of the growth being sarcomatous.

John Lindsay Steven and James Luke² report a case in which aphasia and mental confusion were produced by a cerebral cyst. There was partial paralysis of the right arm, word blindness and word deafness, and spasms limited to the right side of the face. The patient was trephined over the left motor area and a large hemorrhagic cyst was discovered. This was opened and drained, and the patient completely recovered.

Van Buren Knott³ reports a case of cerebral cyst upon which he operated. The patient was a boy, aged fourteen years. When ten years of age he had fallen out of a wagon, striking his head. The fall was followed by unconsciousness, which lasted for about an hour. He was kept in bed for three weeks, being unable to stand or to walk, and complained of vertigo and headache. He gradually grew better, and at the end of four weeks seemed entirely well.

About three years later it was observed that in walking he dragged the right leg, and that his left eye was crossed; and shortly afterward he began to have convulsions, which became more severe, until he had from six to eight every day. He had been a very bright boy, but became stupid and unobservant. It was found that there was complete paralysis of the external rectus of the right eye, but there was no impairment of vision in either eye, and neither choked disk nor retinitis. The right foot obviously dragged in walking. There was no control of the extensors of the leg, and the knee-jerk was very weak. The grasp of the right hand was about half that of the left, and finer movements of the former were impossible. His memory was bad, his speech slow, and he complained of constant headache. A small scar, marking the site of the injury, was found on the left temple. In the convulsive seizures the right arm and leg were first simultaneously involved, and

¹ Deutsche med. Wochenschrift, July 26, 1900.

² Glasgow Medical Journal, September, 1900.

³ Journal of the American Medical Association, April 21, 1900.

then the attacks spread throughout the body. After one of these attacks he would sleep for several hours.

The facts seemed to point to the existence of a tumor in the motor area of the brain, although the absence of vomiting, optic neuritis, and visual disturbance seemed to count against this view. Knott determined to expose the area just in front of the fissure of Rolando on the right side—the portion containing the centres for the complex movements of the leg and arm, immediately in front of which area is the centre for the movements of the eyeball. This region was exposed by making an osteoplastic flap, and when the dura was opened and turned back a large cyst was found embedded in the tissue of the brain. The cyst was incised, and an ounce of clear, straw-colored fluid escaped. The cyst wall was dissected out and the cavity was packed with iodoform gauze, which was removed at the end of forty-eight hours, when the wound was closed. For the first few days after the operation the patient had several epileptic attacks, but from the tenth day on he had no more. The gait improved somewhat, but did not become normal. The strabismus was unchanged. The pain in the head was relieved and the boy became brighter. He has undoubtedly been much improved, but whether or not he has been cured cannot yet be determined.

D. A. K. Steele¹ reports a case of cerebral tumor for which operation was performed. The situation of the tumor was uncertain, and it was decided to trephine over the right frontal lobe in order to relieve intracranial pressure. When the dura was exposed there was distinct bulging of the brain, and when the membrane was incised the brain protruded markedly. A needle was passed downward and backward into the brain, and at the depth of an inch it entered a free cavity. It was thought that a cyst had been entered. Two or three ounces of clear, cerebro-spinal fluid were withdrawn. The brain was then incised, and it was discovered that the ventricle had been opened. The ventricle was packed with strips of gauze, the ends of which were brought out of the wound. The boy died two days later, and the post-mortem examination disclosed the fact that the tumor was in the cerebellum.

O. M. Steffenson² reports a case of cerebral tumor removed by Dr. L. D. Rogers. The tumor weighed three and one-half ounces and was seven inches in circumference. The growth extended into the cerebral tissue for a distance of three inches and a half, and involved the angular, supramarginal, and first temporo-sphenoidal convolutions. The patient died two hours later from shock and hemorrhage.

Drs. Charles K. Mills, W. W. Keen, and William G. Spiller report a case in which a tumor of the superior parietal convolution was accu-

¹ Chicago Medical Record, January, 1900.

² Ibid.

rately localized and removed by operation. This case was reported at the meeting of the American Neurological Association¹ in the spring of 1900. The symptoms were extremely interesting from a neurological stand-point. The tumor was found in the exact region in which Dr. Mills had located it, and the patient made a complete surgical recovery; all his symptoms improved—his speech returned, the paralysis of the arm and leg to a great extent disappeared, the cutaneous sensibility was restored, and he started on a trip to Egypt. The operation had been performed on November 24th; on April 24th Dr. Mills again saw the patient, who had regained power in both the arm and the leg (although not fully), but the muscular sense was still a little impaired.

The skull of this patient was extremely thick, and Dr. Keen made an osteoplastic flap and partly sawed through the base of the flap with the Gigli saw. He was thus enabled to break the thick base without danger. The anterior part of the flap was a little in front of the fissure of Rolando; the upper border was within a centimetre of the median line, and each side was 10 cm. long. A flap was cut in the dura with the base up, and a tumor was discovered at the anterior upper angle. The tumor was 5.5 cm. by 4.5 cm., and weighed 1 ounce and 3 drachms. It was successfully removed, but in order to accomplish its removal it was necessary to rongeur away a portion of the bone in front. The growth had evidently been at first subcortical and had only recently burst through the cortex. With the tumor there was removed a long cyst, like the finger of a glove, which extended four inches into the substance of the brain, and contained between one and two ounces of fluid. Dr. Spiller's examination showed that the growth was an endothelioma which took origin from the walls of the bloodvessel.

Hugh T. Patrick² reports some additional cases of brain tumor. The first case is improving under the use of iodide of potassium. In the second case a diagnosis of tumor of the anterior part of the right lobe of the cerebellum or of the base of the cranium was made. Dr. Christian Fenger operated and discovered the growth in the region in which it had been located. He removed it and found it to be an osteosarcoma springing from the petrous portion of the temporal bone. This patient did not survive. There are several other interesting cases reported by Patrick, some in which the tumors were removed, some in which palliative operation was performed, and others in which medical treatment alone was employed.

Removal of the Gasserian Ganglion. R. J. Pye-Smith³ reports a case of removal of the left Gasserian ganglion in a man, aged seventy

¹ New York Medical Journal, May 12, 1900.

² Chicago Medical Record, January, 1900.

³ Quarterly Medical Journal, November, 1899.

years. The man died two years after the operation. The operation benefited him very positively, but did not give him absolute freedom from pain. This partial failure of the operation is sometimes noted. Pye-Smith had operated by the Hartley-Krause method. In this case the ganglion was removed by means of a curette, and the partial return of the pain might be explained on the supposition that the entire ganglion had not been removed. Dr. Keen has come to the conclusion that in some of his earliest cases he failed to completely remove the ganglion. A recent case of Dr. Keen's, commented on later, proves positively that pain may remain even after complete removal of the ganglion.

In the case reported by Pye-Smith a pathological study was made of the ganglion and the nerves. Many of the nerve fibres were degenerated; there was small cell infiltration of the connective tissue along the lymphatic channels, and the lymph spaces about the ganglion were filled with small round cells; there was thickening of the internal coats of the arterioles, and in some cases complete occlusion by obliterative endarteritis; but there was no manifest degeneration of the ganglion cells.

Although some pain persisted after this operation, there was never any severe paroxysm. Before the ganglion was taken away the peripheral nerves were removed, and after the ganglion was taken away it was noted that there was no pain in the distribution of the second and third divisions, and that the only pain felt was in the eye.

Pye-Smith points out that the procedure known as the Hartley-Krause operation was performed by Hartley in August, 1891, and by Krause independently in February, 1892. He regards it as a simpler and easier method than that practised by Rose through the pterygoid region, and he also prefers it to the transmaxillary route adopted by Rose in his first case, and to the intradural route employed by Horsley in some cases. He thinks that in Rose's method there is considerable danger of sepsis through wounding the Eustachian tube, and that the wide exposure of the arachnoid in Horsley's method renders the patient liable to a like danger. The findings reported in this case, like those reported by several other observers, suggest that obliterative endarteritis accompanies, if it does not cause, the disease known as *tic douloureux*.

Thomas¹ reports two operations on the Gasserian ganglion by the Hartley-Krause method. In one case the bone flap was replaced, and in the other the meningeal artery was torn and the flap was not replaced. Thomas says that we ought to chisel through the posterior limb of the osteoplastic flap before attacking the anterior, where the artery lies. He has not been satisfied with the ordinary method of cleaning the

¹ British Medical Journal, October 21, 1899.

scalp by shaving, etc. He uses a powder to destroy the hair and remove the epidermis. The chief ingredient in the powder is sulphite of barium.

A number of surgeons tear out the distal portions of the divided second and third divisions, in order to prevent any regeneration of the nerve trunks, but Thomas thinks a better method is to plug up the foramina with Horsley's wax or with the mercury amalgam which is used by dentists.

F. X. Dercum, W. W. Keen, and W. G. Spiller¹ report a case of endothelioma of the Gasserian ganglion. Two successful resections of the ganglion were performed, the first by the Hartley-Krause operation and the second by an intradural operation. The patient was a man, aged thirty-two years. Dr. Abbe, of New York, had removed some glands from the neck which were said to be endotheliomatous. Later the same surgeon removed the infra-orbital division of the fifth nerve because of neuralgia. The pain was somewhat mitigated, but still continued; it finally became terrible, and it was decided to remove the Gasserian ganglion. The neuralgia was persistent and not paroxysmal, and involved all the branches of the trifacial; there was hyperæsthesia in the distribution of the fifth nerve and somnolence. These symptoms seemed to point to organic disease of or about the Gasserian ganglion.

Dr. Keen removed in large part a tumor occupying the position of the Gasserian ganglion. The foramen rotundum seemed to have become obliterated. The fragments of tumor looked like fibrosarcoma; but the operation did not cure the pain, and it became necessary to re-operate.

The former osteoplastic flap was turned down, the dura was lifted up, and it was found that the foramen ovale was open, but that the foramen rotundum was plugged. Between these foramina was a third opening, which had probably been made by the gouge in the first operation. A mass of tumor tissue could be felt. The dura was opened, and on the inner surface there were seen a number of small granulations like miliary tubercles, and there were one or two doubtful granulations on the pia, which membrane was a little clouded along the vessels. The brain was lifted by a broad retractor, and a gelatinous mass, looking like sarcoma, was found to fill the opening in the dura made by the first operation. This mass was gouged away; the dura was closed with a continuous catgut suture and the external wound by sutures of silkworm-gut, and a small gauze drain was introduced. For a few days the patient suffered from post-operative delirium, but recovered within a week. This is the first tumor of the Gasserian ganglion

¹ Journal of the American Medical Association, April 28, 1900.

reported in the United States, the third tumor of the kind ever reported, and the first case that has ever been operated upon. This operation did not free the patient from the pain, and he still has to take morphine for relief.

In this case the Gasserian ganglion was most unquestionably extirpated, and yet the pain persisted. It has been suggested by Dr. John K. Mitchell that the persistence of the pain after the removal of the ganglion might be explained by the presence of sensory fibres in the facial nerve—a view rendered probable by the observation that there is slight loss of sensation present in cases of paralysis of the facial nerve. Dr. Mills says that in cases like the present, in which the Gasserian ganglion is slowly and gradually involved, there may be a gradual substitution of function through the facial nerve. The persistence of pain, he thinks, might be referred to degeneration in the sensory root of the fifth nerve, and, perhaps, also to changes in the cerebrum; and he believes that there may be projection of pain to the surface in just the same way as there is psychic projection of pain beyond the stump of an amputated limb. Dr. Spiller's pathological report shows that the case was an endothelioma.

Harvey Cushing¹ maintains that the degree of freedom from pain after the removal of the Gasserian ganglion depends upon the thoroughness of the removal, and that the ganglion should be preserved intact during the removal, in order that we may satisfy ourselves that it has been extirpated, and also in order that we may make careful pathological observations. He has devised a modification of the Hartley-Krause operation, and makes a trephine opening through the temporal fossa so low down as to allow the extradural manipulations to be carried out below the arch made by the middle meningeal vessel. When this method is employed the meningeal artery is not injured at either of its fixed points—*i. e.*, the foramen spinosum of the sphenoid bone and the sulcus arteriosus of the parietal bone. Working underneath this arch, and with but a small amount of elevation of the temporal lobe, the ganglion with its sensory root may be most satisfactorily exposed. In Cushing's operation there is the maximum amount of exposure and the minimum amount of compression of bone and injury of bloodvessels. Cushing reports four cases in which this operation was performed.

Chronic Suppurative Middle-ear Disease and its Results. It has been estimated that about 1 per cent. of the population suffer from chronic suppurative disease of the middle ear. Any person that labors under this malady is in constant danger. If possible, the disease should be cured by irrigations, the introduction of astringents and antiseptics,

¹ Journal of the American Medical Association, April 28, 1900.

the removal of polypi which interfere with drainage, or the extirpation of the necrosed bones of the ear. If the condition is not cured by any of these procedures the mastoid process should be opened and gouged out, and if, at any time during the existence of chronic suppurative middle-ear disease, there are evidences of involvement of the mastoid, such an operation should be at once performed. The fact is, that in any chronic case of suppurative trouble of the middle ear it is extremely probable that the mastoid is also involved.

Küster¹ advocates the employment of an osteoplastic operation on the mastoid. He makes a flap of skin, periosteum, and bone over the mastoid antrum, the base of the flap being toward the ear. After the completion of the operation the interior of the mastoid is packed with gauze and the end of the gauze is carried out through the wound. A piece of bone is then cut from the bone flap in order to permit of the emergence of the gauze, and the flap is replaced. This operation can be quickly performed, and it leaves only a slight scar; but it is, after all, questionable whether in most cases it is desirable to expend the time and to take the trouble.

What is known as Bezold's abscess (*i. e.*, pus travelling down from an opening in the mastoid into the digastric groove and along the digastric muscle) is a condition often unrecognized. Ernest Waggett² says that usually the condition is not recognized until the case is very far advanced, and he reports a case which was at first thought to be enlargement of the glands arising secondarily to mastoid disease. It was found, however, that when pressure was made upon the swelling pus flowed out of a small opening in the tympanic membrane. The mastoid process was opened, and a fistula was discovered which passed through the bone and communicated with a cavity outside of the mastoid. In one case on which I operated some years ago a supposed abscess of the neck was opened and the sinus was traced up along the posterior belly of the digastric muscle, right into and through the mastoid process. As is well known, abscess of the brain may follow upon suppurative conditions of the middle ear and mastoid. When the symptoms point to the development of a brain abscess the surgeon opens the mastoid process, clears it out, and sterilizes it as far as possible, and then proceeds to trephine the skull at Barker's point and to seek for an abscess in the temporal lobe; failing in this, he seeks for pus in the cerebellum. These operations occasionally give brilliant results; but, as a matter of fact, if the patient survives the immediate effects of the operation, although there is apt to be decided temporary improvement, death often takes place

¹ Centralblatt f. Chir., 1899, No. 43.

² British Medical Journal, September 8, 1900.

within a few days or weeks. This is probably due to the fact that in many cases there are multiple abscesses, and that in no case is it possible to thoroughly sterilize the interior of the abscess.

The *Quarterly Medical Journal* for November, 1899, comments upon an article by F. Röpke,¹ in which the opinion is expressed that the curative value of operations for otitic brain abscess is positive, although it has been overestimated. This author points out that we may miss the pus if we make but one or two exploratory punctures; in one of his cases he did not find pus until he had made a fifth puncture, and in one of Stoker's cases it was found by a ninth puncture.

It has been pointed out by Hansberg that the ventricle will not be wounded by a puncture almost an inch and a quarter deep. Röpke reports 142 cases, and says that 59 of these were cured so far as life was concerned. The majority of those who died, he says, did so within a few days or weeks of the operation; but a few died several months after it. In six of the cases death was directly due to an accident during the operation, but in half of the cases the fatal complication already existed when the operation was performed; and he says that in the majority of the remaining half of the cases the operation was unable to prevent the extension of the process. In twelve of the cases which were cured secondary operations had to be performed. In ten cases there were marked general disturbances after the operation, for instance, attacks of dizziness followed by unconsciousness, but only in two cases was this permanent. The author estimates that about 40 per cent. of the cases may be regarded as cured.

Septic Thrombosis of the Sinuses. It has been definitely proved that an early operation should be performed in thrombosis of the sigmoid sinus. An important part of this operation is the ligation of the jugular vein—a proceeding originally suggested by Janfal in 1880. When the jugular vein has been ligated the propagation of the clot or the dissemination of a broken-down clot is prevented, and the vein may be opened and its septic contents removed. There have been a number of successful instances reported in which the double operation was performed—*i. e.*, opening and cleaning the sinus and tying and opening the vein.

The more advanced the case the worse the prognosis, although occasionally a case will recover even when far advanced; for instance, in a case operated upon by Dr. Spencer and myself not only was there a clot in the jugular vein, but septic endocarditis existed, and the patient recovered after a radical operation and treatment with antistreptococcic serum.

¹ *Zeitschrift f. Ohrenheilkunde*, vol. xxiv.; translated by Arnold H. Knapp, *Archives of Otolaryngology*, vol. xxviii.

James F. McKunon¹ makes an analysis of the symptoms met with in these cases. He says that in the majority of cases distinct chills are met with. In cases in which chills are absent the process is not infective. The fever is produced by the septic matter which enters into the circulation; and if a considerable quantity enters rapidly the temperature quickly rises to 104° F., or even higher. This is a contrast to what is found in abscess of the brain, in which the temperature is low, and, therefore, we should remember that in sinus thrombosis complicated with cerebral abscess there may be very trivial fever or no fever. The pain is usually greater than that produced by ordinary inflammation of the mastoid processes. There is nearly always nausea and also vomiting. In nearly all cases consciousness is more or less dull, and occasionally retinitis is present. In two of the author's cases there was puffiness of the eyelids of the affected side; in five out of seven cases there was œdema over the mastoid. Gerhart's symptom was not met with in his cases. This symptom is an increased amount of blood passing through the jugular of the sound side when pressure is made upon both the external jugular veins. In no case was there cord-like swelling along the internal jugular, but in two cases there was enlargement of the lymphatic glands of that region. The author denies the assertion that sinus thrombosis is only a disease of adult life, and reports a case in a child, aged three years.

The sinus should be thoroughly exposed before it is opened, and the field of operation should be washed with peroxide of hydrogen and then with alcohol, and an aspirating needle should be pushed into the sinus and carried for an inch or two along its lumen. If still in doubt after using the needle a small incision should be made. When the clot is found it should be removed with a curette, and the blood should be allowed to flow from the proximal end of the vessel for a few minutes, in order to remove septic material, and the flow should be arrested by packing with gauze. The lower end of the sinus is treated in a like manner. When there is no jugular involvement we should proceed to pack the sinus at the bulb with gauze, and do nothing else; but if a disintegrated clot or pus is found the jugular vein should be exposed, ligated just above the clavicle, and resected, and any of the branch veins found involved should be ligated above the region of involvement and removed with the jugular. All enlarged glands should likewise be taken away. The soft parts of the neck should then be sutured to within an inch of the bulb, and the pus and disintegrated matter removed from the sinus.

Joseph Jamieson² reports a case of septic thrombosis of the cavernous

¹ The Laryngoscope, June, 1900.

² Colonial Medical Journal of Australasia, February 20, 1900.

sinus in which it seemed to be proved by the post-mortem that carious teeth had produced phlebitis, starting from the alveoli and passing by way of the pterygoid plexus to the cavernous sinus.

Idiocy and Hydrocephalus. Now and then a surgeon still operates with the hope of benefiting an idiot or of curing hydrocephalus. A. Montini¹ operated upon a child, aged three years, presenting typical evidences of chronic hydrocephalus and idiocy, with convulsions. The surgeon trephined the skull and drained the ventricle, removing a large amount of cerebro-spinal fluid. The child had a fierce convulsion and became comatose, but reacted after artificial respiration had been employed for a time. The operation was of great benefit, because the convulsions ceased and the child became able to regulate and control many muscular movements. In view of the dreadful condition of most of the victims of hydrocephalus, operative intervention is occasionally justifiable, and the operation which promises the most seems to be the establishment of drainage between the ventricle and the subarachnoid space, as this operation can be very quickly performed and inflicts but trivial traumatism upon the brain.

Lowenstein,² after reporting a case of Czerny's in which craniotomy was performed for idiocy without the slightest benefit, gives an extended study of the statistics of these operations, and reaches the positive conclusion that almost invariably the operation has been quite useless; he does not think it is a justifiable procedure. This is the conclusion reached by most surgeons.

¹ *Gazetta degli Ospedale*, August 12, 1900.

² *Centralblatt f. Chir.*, 1900, No. 17.

INFECTIOUS DISEASES, INCLUDING ACUTE RHEUMATISM, CROUPOUS PNEUMONIA, AND INFLUENZA.

By FREDERICK A. PACKARD, M.D.

ACUTE ARTICULAR RHEUMATISM.

Etiology. Last year there was seen too late for notice by me in the volume for March, 1900, an article bearing upon the etiology of rheumatism, contributed by Westphal, Wassermann, and Malkoff.¹ Their study was based upon three cases of polyarthrititis, followed by chorea, occurring in young girls. In only one of these cases were there outspoken signs of endocarditis, although this lesion was present in all of the cases. In all three cases the chorea was severe and accompanied by marked psychic disturbances. Albuminuria and herpes labialis with fever were present; and in one of the cases acute parenchymatous nephritis, in the other two fibrinous pleuritis, were present.

Complete bacteriological examination was made in one of these patients whose chorea began one month after an acute attack of articular rheumatism. The patient died in collapse before a month had passed after the onset of choreic symptoms. While under treatment for chorea no articular manifestations were present. At autopsy there were found general hyperæmia of the internal organs, very slight exudate on the mitral leaflets and recent parenchymatous nephritis. In no place was there evidence of suppuration. Under strict antiseptic precautions blood from the heart, pericardial fluid, pieces of the mitral valve with its exudate, pieces of the spleen and of the cerebrum, were saved for investigation. On bacteriological examination there was found a micro-organism which produced, when injected into the blood-stream of animals, high fever with multiple joint involvement, and ordinarily death. The micro-organism obtained from the human subject retained its power of producing characteristic pathogenic effects for four and a half months, during which time eighty animals were employed. It was found that after the inoculation the incubation period was variable, but usually occupied three days, although in many six to

¹ Berlin. klin. Wochenschr., July 17, 1899, p. 638.

ten days were required. In their experimental work the observers frequently saw swelling in one joint disappear and an articulation far removed show evidence of disease. On opening the swollen joints it was found that all of the structures were much inflamed and in the cavity of the articulation an exudate, which was composed of cloudy serum or of fluid rich in leucocytes, according to the amount of the culture injected. In this joint exudate they found a micro-organism, cultures of which from the animal gave rise to multiple joint inflammations when injected into a new series of animals. On culture of the organism it was found to be a streptococcus. In the tissues and in the blood this streptococcus obtained on culture was found to present itself as a diplococcus also. For the growth of the streptococcus a high alkalescence of the culture media was required. Good growths were obtained on the addition of peptone.

The question naturally arises as to the part played by this organism in producing articular and nervous symptoms and signs respectively. At the time when the cultures were made the articular manifestations had nearly disappeared, so that the connection of the micro-organism with the latter is only seen through the remarkable predilection for the joints in animals subjected to injection of pure cultures of the organism obtained. The study of this case should stimulate further work upon the bacteriology of acute articular rheumatism without subsequent chorea by means of the methods of culture and the media employed in this case.

An interesting contribution to the etiology of rheumatic fever has been made by Poynton and Paine.¹ After reviewing the literature upon the bacteriology of rheumatism, and a *résumé* of the various views that have been held to account for the disease upon the theory of its bacterial origin, the authors make a detailed report of their own examination of cases of the disease and the experimental work performed upon animals. In eight successive cases they found a diplococcus which grew in chains in liquid media—a mixture of milk and bouillon rendered slightly acid with lactic acid being found to be the best material for its growth. In three cases they isolated this organism in pure culture during life from the blood of patients suffering from pericarditis of acute rheumatic origin, while they also found it in the pericardial fluid after death, from the heart valves and from the throat of a rheumatic patient. In five of their eight cases this organism was present in pure culture; in one it was associated with a small bacillus. In two of their cases the character of the organism was not fully investigated, while in one the growth was contaminated by a sarcina. On two occa-

¹ Lancet, September 22, 1900.

sions the diplococcus was found in the pericardial exudate, which was acid. Aside from the situations mentioned they stated that the diplococci may be demonstrated in unincubated pericardial fluid, in pericardial fluid after incubation and the films made from recent vegetations, from the blood of the heart-wall, and, as mentioned above, from the throat.

They draw attention to the resemblance between these diplococci found by them and the organism described by Westphal, Wassermann, and Malkoff. Pericardial fluid obtained from a fatal case of rheumatism was inoculated into a rabbit, with the result that three days after the inoculation there was swelling of some of the joints, with loss of flesh, and death at the end of ten days. An excessive amount of fluid was found in the joints affected and in the pericardium. There was no evidence of pericarditis or of endocarditis as the result of the inoculation. From the articular fluid obtained from the animal inoculated the same diplococcus was found by direct examination and by culture, while the same organism was found in the tissues of the mitral valve. From a culture of the articular fluid intravenous injections were made into a second rabbit. This was followed by the successive involvement of many joints and the development, seventeen days after the inoculation, of a systolic murmur at the base of the heart. This murmur disappeared after two days synchronously with the disappearance of the heart-sounds, giving rise to the diagnosis of pericarditis with effusion. At the autopsy upon this rabbit, which it will be remembered was inoculated with cultures taken from the articular fluid of the first animal, there was found an excess of clear fluid in the pericardium, the sac also containing a fibrinous coagulum and being slightly roughened. In the affected joints fluid containing diplococci was found. The mitral valve showed two small white opacities, which were, however, found not to be due to valvulitis. Cultures were taken similar to those from the first rabbit, but injection of the growth into a third rabbit gave no result. However, in a fourth rabbit articular swelling occurred four days after the inoculation. Upon the tenth day a soft murmur was present and was looked upon as of mitral origin. This disappeared, but on the fourteenth day a murmur supposed to be tricuspid was noted. Upon the latter day the animal was killed and there was found excess of fluid in the affected joints and in the pericardium. The mitral valve showed the appearance of an early rheumatic valvulitis, while on the tricuspid valve there was a row of granulations along the border. Diplococci were found in the parietal layer of the pericardium contained in the perivascular lymphatic spaces following the course of the bloodvessels. They also were demonstrable in the mitral valve and in the kidneys.

The experiment was repeated in another rabbit with micro-organisms isolated from this last animal. There developed as the result of the inoculation polyarthrititis, pericarditis, pleurisy, pneumonia, and slight valvulitis. During the height of the disease the animal was killed, and exactly the same lesions which we would expect to find in a similar condition in a human being were discovered at autopsy. From the bladder of this case the diplococcus was isolated, while the same organism was found in the various inflammatory exudates.

From another human patient the diplococci were found during life in the blood of a case of rheumatic pericarditis. Intravenous inoculation of the diplococcus obtained from this case caused, after four days, wasting and limping, with swelling of one knee-joint. The articular signs disappeared at the end of a week, but five weeks later there was a relapse, with marked weakness of the hind legs and considerable emaciation, without joint-swellings. The possible relation of these developments to chorea is mentioned. A curious sequence was found after inoculating a rabbit with diplococci and a short bacillus derived from a case of rheumatic carditis with pericarditis. Inoculation of two rabbits with the combined organisms gave no result. The organism, however, when used in the third rabbit three weeks later, while at first giving no result, apparently caused a rise of temperature, with the production of a systolic murmur at the apex after a quiescent period of three weeks, although there were no articular manifestations. At this time the animal was killed, and the diplococcus was found in the tricuspid and mitral valves and in the parietal pericardium. The case is detailed of an adult with acute angina, with a previous history of an attack of rheumatic fever and with extensive disease of the aortic and mitral valves. A culture from the throat in the milk-medium employed in the other cases gave a growth of diplococci similar to those described in their other rheumatic cases. As would be expected, the diplococcus from the throat was not in pure culture, but when isolated and injected intravenously it caused in three days in a rabbit dyspnoea and rapid heart action, followed two days later by a loud mitral murmur and death. At the autopsy there was a large vegetation upon the mitral valve, and diplococci were found in the granulations on the leaflets and in the pericardial and pleural exudations, and they were isolated from the blood and cerebro-spinal fluid.

Eight cases of fatal rheumatism are recorded which showed the same diplococci in the heart valves or in the pericardium, while in a fatal case of chorea the diplococcus was obtained from the pia mater and brain. The experiments upon animals which are detailed at some length above were carried out in a precisely similar manner with cultures taken from the pericardial exudate and valvular vegetations

obtained from a case of endocarditis fatal after the development of active rheumatism, with nodules, in a child. It is unnecessary to enter into details in regard to these cases, as they are simply confirmatory of the results already enumerated in regard to the first series.

In addition to these a second case of angina, with cardiac lesion, is related wherein the diplococci were isolated from the throat and produced typical lesions when inoculated into a rabbit. In a footnote added subsequently to the writing of the article they mention the fact that twice they have isolated the diplococci from the urine of a patient suffering from acute rheumatic pericarditis. They consider that the diplococcus isolated by them is identical with the organism described by Triboulet in 1897, referred to in this article last year, and that by Wassermann in 1899, referred to above. While they do not claim that this diplococcus is the only cause of rheumatic fever, they believe that their investigations prove that it is one cause, and that the future may show that this organism, so carefully studied by them, is the cause of all cases of rheumatic fever conforming to the usual type of the disease. From the studies of the cases forming the basis of their paper they conclude that the valves of the heart are attacked from within and that the diplococci are not found on the surface before the connective tissue proliferation forms granulations and breaks down. In the pericardium they are found in the deeper part of the visceral layer, in the fibrinocellular exudate, and in the parietal pericardium. They may be present in these tissues without producing any marked local appearances. During the acute phase of the rheumatic pericarditis they are said to circulate in the general blood-stream. The diplococcus was found once in a rheumatic nodule in the human being, and they found in a rabbit this same lesion over a vertebral spine. They point out the importance of the finding of a diplococcus in the kidneys of the rabbits used in their experiments and their having isolated and cultivated them from the urine in the bladder of rabbits. They suggest that possibly the cases of acute nephritis without apparent cause that are sometimes seen in children may be the result of infection by this organism. The occurrence of changes in the livers of their rabbits, precisely resembling those found in one of their natural human cases, is, to say the least, an interesting coincidence. The absence of any visceral suppurative lesions in their experiments is to be noticed. They would explain the occurrence of malignant endocarditis, at least in some cases, by the diplococci reaching the surface of the valve, there multiplying with great rapidity and forming a possible source for emboli.

While it is desirable that the work performed by Poynton and Paine should be repeated by other observers, their experiments seem to have been so carefully carried out that strong evidence will be necessary to

overthrow their conclusions, especially in view of the fact that inoculation of pure cultures into animals produced articular and serous membrane inflammations closely resembling acute rheumatic polyarthritis in man, and hence furnished strong confirmatory evidence of the results obtained by Westphal, Wassermann, and Malkoff. The results of both sets of observers fail, however, to throw light upon the frequent sterility of the articular fluids in human polyarthritis rheumatica, unless the variations in the media employed by them in cultivating the organism may explain the latter.

Achalme,¹ at the recent International Congress of Medicine, contributed another article upon the microbial origin of acute articular rheumatism. To the characteristics of the organism described by him which he has previously attributed to it he adds the following: The bacillus causes acid fermentation to occur in glucose, lactose, saccharose, maltose, arabinose, galactose, manite, glycerin, amidon, dextrin, and glycogen. It dissolves fibrin and coagulates albumin; sporulates and freely reproduces itself in alkaline, but not in acids of media.

He denies the possibility of its presence being due to cadaveric infection. The bacillus is not claimed to be specific, because it can give rise to a variety of dissimilar affections, such as puerperal infection, certain gangrenous phlegmons, and appendicitis; but acute articular rheumatism, with a tendency to involve the viscera, is most characteristic of its activity. He says that the visceral lesions are the only sites of the bacilli, the other phenomena of rheumatism (especially the articular involvement) being of toxic origin.

An interesting case of rheumatic manifestations occurring in two people living in intimate contact is reported by Lawson.² A boy, after bathing, developed tonsillitis, followed by arthritis of many joints, and endocarditis. Ten days later a man sleeping in an adjoining bed had acute rheumatism, followed by endocarditis.

The infectiousness of acute tonsillitis of certain forms not caused by the Klebs-Löffler bacillus is well recognized. The occurrence of articular manifestations in acute rheumatism has been frequently noted. In a few cases occurring in the literature endocarditis has been recorded as occurring in immediate association with acute tonsillitis. The rational explanation of the cases reported by Lawson is that the boy developed tonsillitis, which happened to be followed by articular and endocardial manifestations. The man contracted tonsillitis, or, rather, was the subject of tonsillar infection as the result of intimate association with the first case. His tonsillar infection also happened to be accompanied by articular and endocardial disturbance.

¹ Abstract in *Gaz. hebdomadaire de Méd. et Chir.*, September 27, 1900, p. 920.

² *British Medical Journal*, May 26, 1900, p. 1284.

INFLUENZA.

Symptomatology. Forchheimer¹ has called attention to a cough occurring in influenza among children which closely simulates that seen in whooping-cough. This peculiar cough he has observed in three epidemics of influenza. He states that sublingual ulcer is often more marked in this condition than it is in whooping-cough. The paroxysm differs from that seen in pertussis in the shorter duration of the paroxysm, and consequently the slighter degree of cyanosis. In the treatment of the condition he advocates the employment of large doses of quinine. It would have added interest to the paper had the author said whether or not he had made investigations in regard to the presence or absence of enlargement of the bronchial glands in these cases. Certainly during the course of and after influenza enlargement of these glands is frequently present, as is evidenced by paroxysmal cough, dulness in the spinal gutter or beneath the manubrium, with the presence of Eustace Smith's sign (murmur over the manubrium on full extension of the head), and sometimes unilateral diminution of the breath sounds with preservation of resonance.

Rieger² has recorded a curious swelling of the face and head, with neuralgic pains, followed by itching of the face and vesiculation, in the case of himself and two other people in a local outbreak of the disease. The swelling of the scalp was very marked, but there was no redness. On the other hand, the skin was pallid and showed swelling of the veins. Frequent eruption of new lesions took place, the swelling in each region lasting only twenty-four hours. The skin over the lower jaw was not involved, but that on the nose and cheeks finally became of a dark-red color. Beneath the skin a fluid exudate was present. The swelling was symmetrical, bilateral, and extended to both sides from the middle line. It was most marked over the bony prominences and was little noted over the muscular portions of the face. During four or five days while the eruption was present there was fever.

Complications. Austin³ has recorded three cases of endocarditis coming to autopsy. The first case showed bacilli in the cover-slip preparations from the inflamed valves. Some of these were within leucocytes, but they were usually free. They showed both uniform and polar staining. Smears from his second case showed a great number of short, slender bacilli, sometimes slightly curved, showing polar staining and completely decolorizing by Gram's method. Cul-

¹ Archives of Pediatrics, November, 1900.

² Münch. med. Wochenschr., January 2, 1900.

³ Johns Hopkins Hospital Bulletin, October, 1899, p. 194.

tures on agar-agar were negative. Sections of the leaflet showed the same organism. In his third case the same conditions were present as in the first case, while bacilli were found in the thrombi from the valves and also in the alveoli from the congested lung.

Jehle¹ has reported two cases of influenza in which the bacillus of that disease was found in the vegetations springing from the aortic valves. In one case the bacillus was present in pure culture, in the other it was mixed with staphylococci. In one of the cases there was no pulmonary lesion. He concludes that the influenza bacillus can be disseminated throughout the body by the bloodvessels or by the lymphatic paths.

The importance of cardiac manifestations of severe grade during and after an attack of influenza has been repeatedly pointed out during the past few years. "Acute Dilatation of the Heart in Children during the Course of Influenza" is the subject of a paper by F. Forchheimer in the *Jacobi Festschrift*. He gives in detail the history of one case, a girl, aged twelve years, who in the midst of an attack of influenza, which was accompanied by severe paroxysms of coughing, developed a sudden condition of collapse, with rapid breathing and slight cyanosis. Marked extension of cardiac dulness of the right border of the sternum was found, which rapidly increased from 1 cm. from that point during rest up to as much as 2 cm. after attacks of coughing. Soft, systolic murmurs were heard over both the mitral and tricuspid areas. Gradual recovery followed, and at a subsequent examination the heart seemed to be perfectly normal.

Another case is mentioned where again there was severe coughing, resembling whooping-cough, in which somewhat the same conditions were present as in the first case, although the extension of cardiac dulness to the right was not extreme. A previous attack of whooping-cough may have had something to do with determining the effect of the influenza toxin upon the myocardium. Forchheimer concludes that we are justified in assuming two forms of heart dilatation in influenza: one progressively produced by the action of the toxin upon the nervous system of the heart and possibly upon the myocardium; another occurring in conditions materially interfering with the outflow of the blood because of mechanical obstruction.

While these are extreme cases and the dilatation could be clearly estimated by the extension of cardiac dulness to the right, it is probable that to a minor degree the same condition is frequently present. Probably because of the great adaptability of the vascular system of a child these cases are seldom seen in children, yet in adults minor degrees are

¹ Wien. med. Blät., December 21, 1899, p. 975.

by no means unusual, although such marked and acute dilatation is seldom seen.

While albuminuria is frequently seen in influenza, as in other infections, nephritis due to this cause would seem to be an extremely rare complication as compared to the number of cases of incidence of the disease. Freeman¹ has only found seventeen cases in the literature. It would appear to be more common in children than in adults. Among these only eleven, aside from his own case, were capable of analysis in regard to the clinical phenomena presented. All of the eleven were in children or in young adults, the only exception being one aged sixty-five years. Five cases occurred in children under twelve years of age, the youngest child being three years old. In at least seven of the eleven cases the nephritis was of the acute hemorrhagic form. Seven of the cases were males, five were females.

As regards the time of its occurrence, Freeman found that it might occur early in the course of the disease or long after the acute stage had passed, the earliest time of occurrence being the second day, the latest the thirty-fifth day, and the average date of occurrence being the twenty-fifth day. The complication lasted for from eight days to thirty days. The urine was diminished, albumin was present in various amounts, and blood and various kinds of casts were present in the sediment. Two cases showed no œdema, while in one this sign was but slightly developed. The prognosis in this condition would seem to be good, as out of the twelve cases there were only two deaths. Pathological data were obtainable in regard to six cases among the seventeen collected from the literature. In four of these the kidneys were the seat of parenchymatous degeneration; in one there was parenchymatous and fatty degeneration, while in the remaining cases glomerular nephritis was found. In Freeman's own case, a child, aged four years, blood was present in the urine for five days; casts were found for ten days, and œdema was absent at all times.

Several cases of complications from involvement of the genito-urinary organs are briefly mentioned by Desnos.² Prostatitis would seem capable of being aroused by the poison of influenza, and in one of his cases was of sufficient intensity to produce retention of urine. The occurrence of this condition, with also nephritis in other cases, seems to have been directly due to general infection.

A case of spastic convergent strabismus following influenza occurring in a child, aged seven years, was reported by Theobald³ at the last meeting of the American Ophthalmological Society.

¹ Archives of Pediatrics, October, 1900, p. 721.

² Abstract in La Presse Médicale, March 10, 1900, p. 95.

³ Abstract in Philadelphia Medical Journal, May 19, 1900, p. 1112.

The surgical complications and sequelæ of this disease are the subject of a paper by Felix Franke.¹ One case with the signs of appendicitis was due to inflammation of the iliohypogastric nerve; in another symptoms simulating those of peritonitis were due to inflammation of the eighth and ninth intercostal nerves. The occurrence of acute pain over the inner condyle of the femur resembling ostitis of the epiphysis is noted as of frequent occurrence. True ostitis is, however, sometimes seen, and the author gives examples of that condition. He states that osteoperiostitis of the tibia and nodular periostitis of the same bone are often seen. In two cases of osteomyelitis examination of the pus for influenza bacilli was negative. Maurizio Carvia² records two cases of influenza followed by acute mental confusion and terminating in death after some days. At autopsy, in addition to fatty degeneration of various viscera, he found the meninges of the brain and cord hyperæmic, with chromolytic lesions marked in sections.

PNEUMONIA.

Epidemics. In the *Jacobi Festschrift*, published during the past year, Sir Hermann Weber has put on record a series of cases illustrating the occasional epidemic appearance of pneumonia. Seven cases appeared in the epidemic, all of them scholars at one school. All of them were characterized by symptoms of a severe infection, accompanied in some cases with marked gastro-intestinal symptoms. All of them had the physical signs of pneumonia at one or other of the bases. The observation was made in 1869, and consequently there are no data by which we can judge as to the etiological factor in the disease. It might be questioned whether these cases should be classed with pneumonia or whether they should not rather be looked upon as infections of some other character, with manifestations in the lung, just as we see it in many of the well-recognized members of the infectious group.

Henry Handford³ has related six cases of lobar pneumonia occurring in quick succession in one family and in the same house, while in another instance a young child had lobar pneumonia of both bases shortly after the recovery from pneumonia of an adult member of the family living in the same house. These cases are simply mentioned as examples of what is being more and more recognized, namely, the infectious nature of croupous pneumonia.

¹ Archiv f. klin. Chir., Band lix., Heft 3.

² Revista di patologia nervosa e mentale, March, 1900; Abstract in Gaz. hebdomadaire de Médecine et Chirurgie, April 22, 1900, p. 381.

³ Lancet, July 21, 1900, p. 171.

Complications. ABDOMINAL SYMPTOMS. The occurrence of abdominal symptoms in pneumonia has been frequently noted, and the fact that Marfan has emphasized the frequency of abdominal pain in the pneumonia of childhood has been mentioned elsewhere in this article. Jonesco¹ has reported a case of pneumonia where at autopsy there were found numerous hemorrhagic foci extending through the whole thickness of the mucosa and submucosa of the bowel without erosion or ulceration. No pneumococci were found, but colon bacilli were present, presumably from secondary infection. He considers that the lesions were not embolic, but were the result of the action of pneumonia toxin on the mucous membrane.

This report is especially interesting in connection with an experimental study by Bezançon and Griffon,² in which it was found that, in an animal inoculated into the peritoneal cavity by the blood of another animal dead of pneumococcic septicæmia, in addition to a peritonitis there were in the stomach more or less rounded black areas on the outer surface, corresponding to ulcers of various dimensions upon the anterior and posterior walls of the interior. In addition to these ulcers there were numerous fine petechiæ in the mucous membrane. Another animal in a similar series of peritoneal injections was found to have two ulcers, one round and the other oval, on the anterior wall, with many small, hemorrhagic erosions of the posterior wall. In a third animal treated in the same way two small ulcers of the gastric mucous membrane were found.

INVOLVEMENT OF THE PAROTID GLAND was the subject of a paper by Silberstein.³ During the past year several cases of parotitis complicating pneumonia have been reported in various numbers of the *Philadelphia Medical Journal* following an article by Talley reporting a case seen by him, and mentioning four other cases which had been found in a search of English and American medical literature. Beside Talley's case (page 690), one is reported by Coleman (page 878) and two by Anders (page 1157), while Aldrich (page 877) has called attention to a case previously reported by him in 1898, to which reference was made in *PROGRESSIVE MEDICINE* last year, and Holladay (page 1053) has added one.

Symptomatology. In a paper before the Royal Medical Society of Edinburgh, J. Eason⁴ calls attention to the study of the pupils in lobar pneumonia, which was the subject of a former communication by him

¹ La Roumaine Medicale, 1900, Nos. 1 and 2; Abstract in Lit.-Beilage Deutsches med. Wochenschr., October 25, 1900, p. 244.

² Bull. et Mem. de la Soc. Anat., May, 1899, p. 409.

³ Korrespondenzbl. d. allg. ärztl. Vereins v. Thüringen, 1899, Heft 10, p. 456.

⁴ Scottish Medical and Surgical Journal, April, 1900, p. 342.

last year. The state of the pupil was described in 54 cases. Of these 24 (44 per cent.) had unequal pupils. The inequality was found to be due to the occurrence of unusual dilatation of one pupil. In 21 of the 24 cases the large pupil was on the same side with the pneumonia; in 3 others it was on the opposite side. Among the 24 cases with unequal pupils 15 were apical, 3 were near the apex, 4 were near the middle of the lung, and 2 were basal. Among the 30 patients showing equal pupils, on the contrary, 26 were basal, while 4 were apical, all of the latter being in children. He therefore concludes, and with apparent justice, that the absence or presence of inequality of the pupil depends upon the part of the lung affected. Among the fifty-four cases examined there were only four of double pneumonia. In all of these the pupil was larger on the side on which the lung showed evidence of lesion nearest to the apex. He calls attention to the fact that inequality of the pupils is noted very early in cases of apical pneumonia, while it is seen only at a late stage when lower portions of the lung are involved. The persistence of inequality of the pupils was very variable, and the author suggests that it is possible that its persistence for a long time after the crisis may indicate that resolution is not being perfectly performed. The explanation of the phenomenon is that the pneumonic process causes irritation of the sympathetic system derived from the first, second, and third dorsal nerves. As Eason indicates, the occurrence of the blush on the cheek of the same side as that on which pneumonia is present may also be an evidence of sympathetic irritation. He mentions two or three cases where very marked pallor of the cheek was present on the same side as the pneumonic process. In two cases he has noticed very great protrusion of the eyeball, with widening of the palpebral fissure and dilatation of the pupil on the same side with the pneumonia.

Sighicelli¹ has written an article upon the same subject. He states that bilateral mydriasis is almost always present in pneumonia, and that it is frequently asymmetrical, being greater on the diseased side. He looks upon the mydriasis as due to the pneumonic antitoxin, while the greater dilatation in one pupil may be due to reflex excitation of the superior cervical ganglion produced by inflammation about the pulmonary branch of the vagus. He considers that the absence of mydriasis is unfavorable, as it is an evidence of the absence of antitoxin.

Zanoni² has confirmed the observation of Sighicelli, and concludes that in most cases of pneumonia there is bilateral mydriasis referable to the

¹ Gazz. med. Lomb., February, 1900; Abstract in Epitome of British Medical Journal, May 5, 1900, p. 69.

² Méd. Moderne, 1900, No. 21; Abstract in Centralb. f. inn. Med., August 18, 1900, p. 844.

action of the antitoxin of pneumonia, and in other points agrees with the observations of the Italian writer.

These observations are of much interest, especially if Eason's and Sighicelli's conclusions in regard to the prognostic value of the sign are confirmed by larger collections of cases.

Condition of the Blood. Sello¹ has examined the blood of 48 cases of pneumonia, and found pneumococci present in 12, absent in 36. Of the 12 cases in which the micro-organism was found in the blood 10 died, 1 had empyema and 1 metastatic abscesses. Of those in whose blood the micro-organism was not found only 7 died.

Pane's² results have agreed with these. He states that pneumococci are usually first found in the blood if the resistance of the body is weakened, indicating, therefore, a bad prognosis. Cases of empyema or metastatic foci form exceptions to this statement.

A different result was reached by Silvestrini and Sertoli,³ who found the diplococci of Fränkel in the blood of fifteen out of sixteen cases examined. They state that their presence in the blood is often, but not always, in accord with the severity of the disease. In the diplococci which they obtained from the blood there was great variation in the virulence.

Treatment. In an interesting article upon pneumonia Barr⁴ deprecates the use of the croup kettle upon the ground that it "drowns" the patient. I would question whether this was a proper objection, save only in those cases where there is a large amount of fluid exudate rattling in the air-tubes. Certainly in cases of pneumonia with dry, tubular breathing and teasing, almost unproductive cough, the use of the croup kettle, in some way which we cannot claim to understand, seems to loosen the expectoration, and certainly seems in many cases to be productive of marked relief. Of course, where the respiratory power is very feeble, where collateral edema or coexistent bronchorrhoea fills the air spaces with fluid, there is no necessity for moistening the upper air passages and larger tubes, and it is conceivable that the presence of excessive moisture in the air might increase the respiratory embarrassment. Barr lays stress upon the lack of aid to the heart by the respiratory movements as follows: "There are certain cases which seem to fall victims to the intensity of the poison, but the vast majority of deaths are due to cardiac failure arising from want of proper assistance, owing

¹ Zeitschr. f. klin. Med., Band xxxvi., p. 113.

² Riforma Med., 1899, Nos. 182 and 183; Abstract in Centralbl. f. inn. Med., 1900, No. 5, p. 135.

³ Riforma Med., 1899, No. 16; Abstract in Centralbl. f. inn. Med., 1900, No. 5, p. 135.

⁴ British Medical Journal, June 16, 1900, p. 1461.

to a defective respiratory pump." Doubtless there is considerable truth in this statement. In regard to the use of the ice-bag, Barr states that it may relieve pleuritic pain, but has no influence in controlling internal temperature, while it is possible that the use of the ice-bag may cause empyema because of lowering of the vitality of the affected part. Instead of the ice-bag applied to the chest he advocates the use of large ice-bags to the abdomen when the case is seen early, as by their use the bodily temperature is lowered and the respirations are increased in depth. Barr does not believe in bleeding for the purpose of relieving the right heart, and makes the statement that the emptying of the right heart is impossible by venesection, as the blood cannot be siphoned back from the organ through the veins. Doubtless the last statement is correct, yet we can certainly diminish the amount of blood going to the right auricle if we open one of the large trunks going thereto. Consequently, so long as the right auricle is capable of contraction we can, by depriving this chamber of its ordinary supply of blood, hope to enable it to relieve its overdistention by contraction upon a diminishing amount of blood. While indiscriminate bleeding is to be deprecated in pneumonia, it certainly would seem as though in carefully selected cases venesection may be capable of saving life where death threatens from overdistention of the right heart, which must be looked upon as an occasional cause of death in croupous pneumonia.

In the *Practitioner* for March, 1900, among a series of papers upon pneumonia, there is an interesting one by Dreschfeld upon the treatment of this condition. In the article is a statement by Dr. Washbourn, whose interest in the subject has been evidenced by several articles in the past, in regard to the serum treatment of this disease. The points contained in this statement, which bring the matter up to date, are as follows: Susceptible animals can be rendered immune to inoculations by previous injections of cultivations destroyed by heat, and can be rendered progressively more immune by the use of successively increasing quantities of living cultures, while the blood-serum of animals so immunized has protective properties. The serum is antibacterial, but not antitoxic. If an animal be injected with the serum from an immunized animal after inoculation with the pneumococcus has been performed, protection is afforded if the results of the inoculation have not progressed too far. Thus in rabbits the serum will protect if inoculated during the first quarter of the disease. The protective serum was first prepared from horses by the author."¹ Washbourn's conservative statement is as follows: "With the data at present available it is difficult to arrive at a definite conclusion as to the value of the treatment.

¹ See reference in PROGRESSIVE MEDICINE, March, 1900.

The author has used the serum with apparent benefit in a number of cases, but has also seen cases which have not been influenced in any way by the treatment." Washbourn gives the method of administration as follows: "The serum is administered by subcutaneous injection in the same manner as the diphtheria antitoxin. The dose is from 10 to 20 c.c., which may be given two or three times a day during the attack until the constitutional symptoms have begun to subside. The administration of the serum may be followed by rashes and joint pains similar to those observed with diphtheria antitoxin."

Fanoni,¹ after briefly reviewing the various antitoxins already employed, speaks of the use of the antipneumotoxin first described by Pane, which has been mentioned in the last two years in the corresponding volume of this publication. Fanoni has employed the serum in eighteen cases of pneumonia among his private patients. Among the eighteen cases only one died—a mortality of 5.5 per cent. The fatal case was seen on the ninth day of its illness, and was already in the pre-agonal stage, and was given 40 c.c. hypodermatically at one dose. Although the patient's condition was considerably improved on the next day, "the serum only served to retard death for two days." Four of his cases occurred in children, all of which recovered after a few days' treatment. It is said that the serum when injected in cases of pneumonia at a sufficiently early period and in sufficient quantities (40 c.c. of No. 2 daily), and if the serum is not deteriorated by age, it will quickly produce lowering of temperature and an amelioration of all the symptoms, while resolution is said to take place more rapidly.

The use of this method of treatment is the subject of an article by Canby.² One case personally observed by him is given where the administration of 12 c.c. of antipneumotoxin was followed in three hours by a fall of temperature of 2.5°. This fall of temperature continued, but on the next day a second similar dose was administered. The patient was first seized with pneumonia on December 18th, and showed the physical signs of consolidation of the lower lobe of the left lung. Under ordinary treatment with cardiac stimulants an apparent crisis occurred on the eighth day, but this was followed two days later by consolidation of the right lower lobe, apparently resulting from exposure. It would seem, then, as though the antitoxin may possibly have caused crisis to occur as the termination of this second involvement on the second day. The author of the paper deems that one case is not sufficient to allow the drawing of conclusions, nor does it seem to me that the case proves anything in favor of antitoxin. I have frequently observed a precisely similar occurrence in cases treated by the

¹ Pediatrics, May 15, 1900, p. 393.

² Maryland Medical Journal, March, 1900, p. 113.

ordinary and less specific methods, showing, in brief, a pneumonia with consolidation of one lobe followed by crisis, then a second lobe becoming involved, and in forty-eight or seventy-two hours a second crisis, with resolution of the last area. I have frequently been struck by these cases and have always explained them to myself in the following manner: The first "attack" of pneumonia calls forth on the part of the body cells the production of an antitoxin sufficient to bring about the first crisis; the involvement of another lobe may be due to the amount of antitoxin being insufficient to prevent re-infection. The occurrence of the second "attack" calls forth a fresh production of antitoxin in a system that may be presumed to be already somewhat saturated with this substance; consequently, instead of taking eight or nine days for the manufacture of the antitoxin by the body cells, a sufficient amount is produced in two or three days under the stimulus of the toxin absorbed from the lobe last involved. Two other cases of the use of antipneumotoxin in the practice of other physicians are put on record by Canby, one resembling his own case in that there was apparently a second area involved; the other being a case where antipneumotoxin administered on the third day of the disease was followed by crisis after two doses of 20 c.c. each.

Wilson¹ has placed on record eighteen cases of pneumonia treated by antipneumococcus serum, with a mortality of four cases. The dose used varied from 20 c.c. to 460 c.c., its use extending over a period varying from six hours to eight days. The more recently drawn serum seemed to be more powerful than that which had been withdrawn for a longer time. In the discussion upon Wilson's paper McFarland, from whom Wilson obtained his serum, states that there is no accurate way of measuring its strength, and from his remark it is evident that its uniform preparation is a matter of extreme difficulty. One case each of pneumonia treated by antipneumotoxin were mentioned in discussion by Kelly and Rochester.

The use of yeast in the treatment of furunculosis has been employed to a considerable extent for some time, and has been advocated in various infectious processes, upon the theory that the nuclein contained in the cells have some power of neutralizing bacterial poisons. Marie² has been using yeast for the past year in the treatment of pneumonia. He employed it in eight cases, of which many were very grave; no deaths occurred. In a patient, aged sixty-eight years, suffering from pneumonia and with an abundant eruption of furuncles, the use of yeast was advised because of the latter condition, and was

¹ Journal of the American Medical Association, September 8, 1900, p. 595.

² Bull. et Mém. Soc. Méd. des Hôp., May 18, 1900, p. 618.

followed by a rapid cure. This led to its use in the other cases. In the next number of the same journal Faisans confirms the results arrived at by Marie by reporting four cases successfully treated with yeast, in doses of three to four coffeespoonfuls daily.

Pneumonia in Children. The view that the pneumonia of children is usually lobular cannot be allowed to be certainly correct, and doubtless arose, as has been pointed out, from the fact that relatively few children die from primary lobar pneumonia as contrasted with the lobular pneumonia which is frequently secondary or often terminal. Marfan¹ has written an interesting article upon the common forms of pneumonia in children. The youngest case of frank lobar pneumonia seen by him was three months old, and he states that in children younger than this pulmonary consolidation is always lobular. He notes the brusque onset in the midst of perfect health, the frequent occurrence of vomiting, the rarity of complaint of pain in the chest as contrasted with that of pain in the abdomen, and the frequent late appearance of characteristic physical signs. The latter he attributes to the central region of the consolidation. Frequent occurrence of diarrhoea is also mentioned by him. All of these signs have doubtless been noted by anyone having much to do with diseases of children, yet there is probably no other disease, save possibly empyema and osteomyelitis, wherein a mistake in diagnosis is so frequently made by those unfamiliar with the handling of children.

Sequelæ. A case of multiple neuritis following pneumonia has been reported by Connor² before the New York Neurological Society. Three weeks after the beginning of pneumonia there was extensive, almost complete, paralysis of the extensors of the leg and of the left arm and slight loss of power in the right arm, without anæsthesia. There were present some numbness of the finger-tips and an area of hyperæsthesia over the crest of the ilium on both sides. Except for slight girdle sensation there was no pain. At the end of a week after the onset of the palsy there was complete loss of power in the diaphragm. Five weeks passed before improvement began, the diaphragm remaining paralyzed for six weeks. Recovery is said to have been fair.

CHICKEN-POX.

But little of interest has been added to the literature of varicella during the past year. Hans Haenel³ reports the case of a patient, aged one year, who while still suffering from the remains of an attack of

¹ *Semaine Med.*, January 24, 1900.

² Abstract in *New York Medical Record*, September 22, 1900, p. 474.

³ *Centralbl. f. inn. Med.*, 1900, No. 19, p. 482.

whooping-cough developed a sudden rise of temperature. On the second day from 4 to 5 per cent. of albumin with hyaline and granular casts and leucocytes was present in the urine. There were no red blood cells present nor was oedema noted. Fever continued for seven days. On the tenth day vesicles of chicken-pox developed. By this time the albumin had disappeared. He refers to thirty cases of nephritis in the course of varicella which he found in the literature. Ordinarily the signs of nephritis developed after the disappearance of the exanthem and with little general disturbance. In his case, as has been said, the signs of nephritis developed in the prodromal period. He looks upon his case as one of "vicarious" nephritis, the poison having located itself in the kidneys. This view he considers borne out by the abortive character of the exanthem, which consisted of only five lesions. In the same epidemic there was a case with profuse eruption and fever lasting for seven days. One week after the subsidence of fever the temperature suddenly rose and the signs of hemorrhagic nephritis occurred. After six days the albumin disappeared from the urine. In a third case there was present in the urine some albumin, which appeared a few days after the drying of the vesicles, and was accompanied by no rise of temperature. The epidemic among which this case occurred affected six individuals, one-half of which, therefore, had some evidence of renal disturbance in connection with the attack.

DIPHTHERIA.

In the Lower Animals. Cobbett¹ has reported the finding of the bacillus diphtheriæ in the nasal secretion of a pony. The examination of the secretion was instituted because of the occurrence of a case of human diphtheria in the household to which the pony belonged. Not only was the Klebs-Löffler bacillus found in the secretion, but the pony suffered from enlargement of the glands under the tongue, laryngeal obstruction, with difficulty of breathing, and retraction of the abdominal wall. The observation is extremely interesting in connection with the supposed immunity of the horse from this disease, and the author has made some theoretical deductions which are interesting and for which the original article should be consulted.

Treatment. Although the question of diphtheria antitoxin as regards both its use and its dose has formed the subject of many communications to medical literature, it cannot be as yet said that there is anything like uniformity in the views as to the proper amount of the material to be used in cases of varying degrees of severity. Musser² has urged the

¹ Lancet, August 25, 1900, p. 573.

² University Medical Magazine, March, 1900.

use of small, repeated doses of antitoxin rather than the giving of one big dose. His results have compared favorably with those reported by others, and apparently the disagreeable sequelæ in the form of eruptions and albuminuria have been less frequent than where the larger doses are used. He has employed an initial dose of 500 units from birth up to six or eight years of age, his dose being repeated at intervals of six hours if the fever does not fall, if the strength of the patient does not improve, or if the local manifestations are spreading. For children over eight years of age he advises 1000 units as an initial dose, with repetition at intervals of eight or twelve hours, according to necessity. Reports of thirteen cases are appended to his paper, and he states that in all but one there was a critical fall in the temperature in a few hours after the administration of the first dose.

While the theoretical reasoning would seem to be sound, the experience in a vast majority of cases recorded by a large number of observers would seem to point to the advantage to be derived from giving a large dose at the start and repeating with another large but usually smaller quantity when necessary. Park¹ has contributed the results of a comparative study of cases receiving what might be called a small dose (1000 units) as contrasted with what might be called a large dose (2000 units). Ninety-three cases were treated recently with doses of 1000 to 2000 units, irrespective of the character of the case. Of these 93, 14 died (a mortality of 15 per cent.). Forty-two cases received 1000 units; of these 7 died (16.6 per cent.); while 51 cases (erroneously appearing in the text as 15) showed a mortality of 7, or 13.7 per cent. He concludes, therefore, that so far as the figures quoted indicate there is no marked difference between the series receiving 1000 units and that receiving 2000 units. He adds, however, that in two of the cases which received 1000 units the fatal outcome was by no means anticipated on their admission, while in four of the seven fatal cases which received 2000 units the condition seemed hopeless on admission. This, it seems to me, is a strong point in favor of the larger dose, inasmuch as there are few diseases wherein "mildness" can be assumed as the continued character of the attack with less certainty than in diphtheria. There was but little difference in the occurrence of rashes in the two series of cases. Another series of experiments was tried in which every alternate case received from 2000 to 6000 units, the other half receiving double that amount. He concludes that there was no difference observed in the results in the two classes of cases. He recommends the following table of dosage: Very mild cases, 1000 to 1500 units for the first dose; moderately severe cases, 2000 to 3000 units for the first dose; very

¹ Archives of Pediatrics, November, 1900, p. 823.

severe cases, 4000 to 5000 units for the first dose; laryngeal cases, according to their severity, 2000 to 5000 units.

WHOOPING-COUGH.

Etiology. Arnheim¹ has had the opportunity of performing three autopsies upon cases of whooping-cough. One of these died with double pneumonia and convulsions. At the autopsy there were found wide-spread pleuropneumonia, with fresh pleural exudate, bilateral hepatization of the lower lobes, purulent bronchitis, and hemorrhagic infarcts. In material obtained from the bronchi and pneumonic foci there were found numerous small rods, these being especially frequent in the lungs. By culture there were found, beside pneumococci, many bacteria showing polar staining. In sections many small bacilli were found in the neighborhood of the bronchi. His second case was one in which tuberculous infection took place while the whooping-cough was still severe. At autopsy there were found general miliary tuberculosis, bronchopneumonia, cheesy bronchial glands, and purulent bronchitis. In the pus obtained from the trachea, bronchi, and pneumonic foci bacteria showing polar staining were found, both in films and on culture. On section of the lung there were found, at the borders of a tubercle in tissue partly normal and partly pneumonic, small rods showing polar staining. In a third case the study was not complete, as it occurred shortly before the report was presented. At autopsy there were found wide-spread bronchopneumonic foci and atelectasis. Up to the time of the report bacilli could not be obtained in pure culture, owing to the large numbers of streptococci which were present. He states that in many specimens of sputum obtained during life he has found the Czaplewski-Hensel polar-staining bacilli.

Treatment. The number of remedies advocated for use in whooping-cough is, as has been frequently said, a clear evidence of our inability to satisfactorily combat any given case by any one plan of treatment. Kerley² has estimated the value of various drugs in the treatment of a series of 752 cases of this disease. The following is a summary of his conclusions: Insufflation of resorcin and boric acid combined with bicarbonate of sodium was tried in six cases, but discontinued after three days as being impracticable and useless. Inhalation of "vapo-cresoline" was used in ten cases without modifying the disease. Incidentally, I would like to add a word of protest in regard to the use of this proprietary method, which I feel quite certain had in one case seen by me in

¹ Berlin. klin. Wochenschr., August 6, 1900, p. 702.

² Archives of Pediatrics, April, 1900, p. 270.

consultation a decided influence in bringing on complete suppression of urine. When I entered the room with the physician in charge I was decidedly uncomfortable from the amount of carbolic acid, or one of its allies, with which the atmosphere was charged. When we bear in mind the fact that carbolic-acid poisoning was by no means an infrequent accident in the days when the carbolic-acid spray was used as a means of antiseptis, it is not unreasonable to presume that the same bad results may follow the use of this secret preparation, which undoubtedly contains either carbolic acid or some substance closely allied to it.¹

Decided benefit was seen by Kerley to follow the use of medicated steam inhalations with creosote, turpentine, and wine of ipecac. In twenty cases alum, fluid extract of horse-chestnut leaves, and dilute nitric acid were all tried. After a five days' trial they proved valueless or objectionable on account of the production of vomiting. Among twenty-two cases bromoform seemed to produce a good result in three only. The use of hydrochlorate of cocaine, while possessing some value in controlling the severity of the paroxysms, was not considered of any particular value. While quinine is capable of producing some good result, it has to be used in large doses (12 to 20 grains in twenty-four hours in children from two to six years of age). In 17 cases where he was able to continue the use for a sufficient length of time to test it the paroxysms were reduced to one-half in 2 to one-third the number in 15. In 60 cases belladonna was used up to the point of physiological action. After its employment for from five to seven days not the slightest effect was seen from its use aside from its evidences of physiological action. The bromides of sodium, ammonium, and potassium were employed in 60 cases. The three salts were given combined in doses of from 12 to 16 grains daily to a child a year old. The severity and duration of the paroxysms were influenced, although the number of seizures was practically unchanged. Intubation gave the best results, both as regards the severity and the number of the paroxysms. The last two drugs named, bromide and antipyrine, when given in combination seemed to produce the best results. They were, therefore, employed in the form of compressed tablets. For a child eight months of age $\frac{1}{2}$ grain of antipyrine with 2 grains of bromide of sodium, made into a tablet, were administered at two-hour intervals. One grain of antipyrine and $2\frac{1}{2}$ grains of bromide of sodium were prescribed for children aged fifteen months and ordered at similar intervals. Children between the ages of two and a half and four years were given 2 grains of antipyrine and

¹ In confirmation of what I have said in regard to the use of "vapo-cresoline," it is of interest to note that Adams has reported two cases of poisoning by the use of this proprietary remedy in an article (*Archives of Pediatrics*, December, 1900, p. 922) which has appeared just before this goes to press.

3 grains of bromide of sodium at intervals of two hours. He also speaks of the value of fresh air as a well-known remedial agent.

Norton¹ reports the results of treatment of 150 children suffering from whooping-cough with carbonic-acid gas administered by the rectum. Of these cases 143 seemed to be decidedly benefited, both as regards the vomiting, the number of paroxysms, and their severity. The duration of the disease seems not to have been influenced. The method employed was as follows: "A wide-mouthed bottle or jar, holding a pint or more, is supplied with a perforated cork, through which is a glass tube extending not more than half-way to the bottom. To the outer end of the glass tube is attached about three feet of flexible rubber tubing, which has at the end a detachable hard-rubber nozzle suitable for rectal injections. The bottle is filled about one-third with water. Six drachms of bicarbonate of soda are dissolved in this, and there is then added one-half ounce of crystals of tartaric acid. As the tartaric acid dissolves slowly, the gas is liberated at the proper rate for administration. The rectal tube is inserted and the administration of the gas continued as long as desired. The above quantities were found to supply the gas for the longest treatments used, or about ten minutes." In twenty cases where gas prepared by the manufacturers was used no results were obtained. He also mentions three cases of whooping-cough which contracted laryngeal diphtheria while under observation. Stenosis from the latter necessitated intubation. Although there was evidence of beginning paroxysms, and spasmodic cough appeared, there was no glottic spasm at the end of the paroxysm, the air entering the larynx freely through the tube and the paroxysm terminating abruptly without distress or vomiting. On removal of the tube the disease proceeded on as before.

MEASLES.

Prophylaxis. At the last meeting of the American Medical Association a paper was read upon the undesirability of keeping children from contracting measles, especially on the ground that one attack of this disease definitely prevents the recurrence of the disease, and that the disease as it occurs in children is much milder than when it is seen in adults. While with the author of this paper it will be agreed that it is desirable to prevent the occurrence of this disease in grown people, it is a serious question whether we at any time have a right to needlessly allow the contraction of any infection. Of course, it is well recognized that in a perfectly healthy child measles is ordinarily a rather mild infection, yet there are certain possible consequences which should

¹ Archives of Pediatrics, April, 1900, p. 266.

make us pause before purposely allowing a child to contract a disease which is at times fatal itself, which is very likely to be accompanied by catarrhal pneumonia, which leaves the mucous membrane of the respiratory tract vulnerable for a variable but usually long time, which is not infrequently followed by the development of tuberculosis, and after which various more or less troublesome ocular abnormalities are apt to occur. During the past winter and early spring Philadelphia was visited by a wide-spread epidemic of measles, such as at intervals attacks every city. It has seemed to the writer that during this time more than the usual number of cases have been seen with persistently enlarged bronchial glands in children who had suffered from this infection during the epidemic. When we bear in mind the bothersome symptoms that frequently follow enlargement of these glands, and when we consider also how important these groups are in protecting the economy from infection by the tubercle bacillus, and, therefore, how necessary their remaining in a normal condition may be, it would seem extremely doubtful whether it would be justifiable to run the slightest risk of allowing the occurrence of a disease where their involvement could follow. The author of the paper spoken of above speaks of the fact that he was glad he had the measles when a child, yet that having passed through an attack of measles successfully is a cause for congratulation cannot be looked upon as a justification for the omission of anything that could prevent an attack of illness.

Symptoms. Widowitz¹ has examined 158 cases of measles for the presence or absence of Koplik's spots. In 140 (88.61 per cent.) they were found to be present, while in 18 (11.39 per cent.) they were absent. In 115 of the 140 cases where these spots were present there were other prodromal symptoms, while in 25 this was the only sign present. He concludes as follows: "The so-called Koplik's spots are present in most cases of measles, and in many cases they precede, but usually appear at the same time with, other prodromal symptoms. Exceptionally they are also associated with r  theln and other diseases. They are a very valuable but yet not an absolutely safe and reliable early symptom of approaching measles. It is on this account not safe to conclude that measles is present from the presence of Koplik's spots alone without regarding the whole pathological picture." The author states that he has seen them in catarrh of the mucous membrane of the respiratory organs and in follicular angina.

This experience is strongly confirmatory of the value of Koplik's spots, yet the presence of the sign in diseases other than measles (if confirmed) is a serious bar to the value of the sign. It would seem from

¹ Wien. klin. Wochenschr., 1899, No. 37, p. 19.

a comparison with other reports upon this subject that the experience of Widowitz in regard to the appearance of the spots in r  theln is at least unusual.

Among 187 cases observed by Cotter,¹ Koplik's spots were found to be present in 169, absent in 8, and doubtfully present in 10. In 78 of the cases the spots were noted, together with fever and the eruption of the skin, when the patients first came under observation. In 2 cases the spots were present five days before the eruption on the skin appeared ; in 3 they were seen four days before the eruption ; in 4 three days before the eruption ; in 25 two days before the eruption, and in 54 cases one day before the exanthem was present. In the institution wherein his patients were observed no case was seen where Koplik's spots alone existed, as in all of the cases where they were observed slight fever was also present. The significance of a slight rise in temperature is usually valueless as an indication of the forthcoming disease, and this fact does not in any way deprive the spots of their extreme diagnostic value.

Relapse. During an epidemic of measles Harvey² had under observation a child, aged eleven months, who, after the typical prodromes, developed the rash of measles. At the end of a week this had disappeared and desquamation occurred. Two days after the disappearance of active symptoms conjunctivitis and rise of temperature were noted. On the following day there was marked universal rash accompanied by bronchitis and gastro-enteritis, followed by profuse desquamation lasting ten days.

Pathology. In 14 consecutive autopsies on cases of measles Freeman³ has found focal necrosis of the liver in 4 cases.

Complications. A case was reported by England⁴ as an instance of cerebro-spinal meningitis complicating measles. The patient was six years of age and contracted measles during a house epidemic of the disease. On the day after the temperature had reached the normal point, and while the eruption was fading, he had some obstruction of the nose and later in the day had a sudden convulsion, followed by deepening stupor and rise of temperature. The stupor continued, but no paralysis was noted. On the third day a continuous succession of convulsions occurred until his death, thirty-eight hours after the first evidence of the nervous trouble. Cultures from the nose showed diplococci, which were found from smear preparations to be intracellular. It is a question whether it is proper in this case to speak of the cerebro-spinal fever as

¹ Archives of Pediatrics, December, 1900, p. 918.

² New York Medical Record, December 2, 1899, p. 838.

³ Archives of Pediatrics, February, 1900, p. 90.

⁴ Montreal Medical Journal, November, 1899, p. 859.

complicating the measles rather than to look upon them simply as two infections running a simultaneous course.

Sequelæ. H. A. West¹ reports a case of meningitis following four days after the subsidence of an attack of measles. As the author points out, influenza was epidemic at the time, the mother who nursed the child being attacked by the disease, and that the meningitis was probably due to infection by the influenza bacillus. The child seems to have perfectly recovered.

SCARLET FEVER.

Etiology. A further communication upon the specific micro-organism of scarlet fever as described by him is given by Class.² A culture of *diplococcus scarlatinae* was obtained from the throat of a patient upon the first day of the disease, and was found to be almost pure on examination. From this a pure culture was obtained by the use of agar plates. When minute quantities of this culture were injected into mice death followed within twenty-four hours. From this culture, obtained by spreading on agar, flasks of bouillon were inoculated and the micro-organism was allowed to grow in the incubator for ten days. At the end of this time a straw-colored alkaline fluid was obtained by filtration through a porcelain filter. Five minims of this filtered culture were injected into two mice, one of which was found dead at the end of twenty-four hours, while the other lived for thirty-six hours. Culture tubes inoculated from the blood of the heart and spleen of these two animals showed no growth. A fatal ending followed in twelve hours after the injection of a similar quantity into two ordinary gray mice. A sow was then given 1 c.c. of the filtered culture by injection into the muscular tissues on the inner side of the thigh. Twenty-four hours after the injection the temperature had risen 2° F., and the animal was evidently sick. From that time the temperature gradually fell to normal. Nineteen days later, the animal having recovered, 2 c.c. were injected in the same way. Within twenty-four hours the temperature had risen 3° F., and at the end of forty-eight hours the temperature had risen still one degree higher, and there had appeared a marked reddening over the abdomen and the inner side of the thighs. This erythema lasted about seventy-two hours. At the end of six days all the results of the injection seemed to have disappeared. Sixteen days after the second injection a third dose of 3 c.c. was administered.

¹ Annals of Gynecology and Pediatrics, vol. xiii., No. 9; Abstract in Archives of Pediatrics, October, 1900, p. 775.

² Philadelphia Medical Journal, June 23, 1900, p. 1421.

This produced only a transitory rise of temperature of 1.5° F., without accompanying constitutional symptoms. A fourth injection, made seventeen days after the third and in which 5 c.c. were injected, produced a rise of only 0.5° F. of temperature. Two weeks after this last injection eight ounces of blood were collected in a sterilized flask from the femoral artery. To this 30 minims of a 40 per cent. solution of formalin were added and the flask was placed in a cooler for forty-eight hours. At the end of that time a clear, reddish fluid, which had separated, was drawn off into small, sterile bottles. In testing the serum so obtained in regard to its immunizing properties it was found that mice were so susceptible to the diplococcus that while the injection of the serum allowed of their withstanding a larger quantity of the germ than where the serum was not used, the animals were too small and, as has been said, too susceptible. White rats were found to have a natural immunity. It was decided, therefore, to employ guinea-pigs as the animals to be used for the experiments.

In previous work it had been found that these animals were less susceptible than mice, and usually died within one or two weeks after intra-abdominal injection of a virulent culture, although subcutaneous injections had little or no effect. Four sets of experiments were instituted, two animals being used for each. One animal in each series received 1 c.c. of water containing 0.1 c.c. of culture injected into the abdomen; the other animal in each set received with the injection of the culture a subcutaneous injection of 1 c.c. of the serum obtained by the method described above. In the first series the animal receiving the serum survived, while the other animal died within two weeks. In the second series a similar result was obtained, except for the animal dying before the first week was ended. In the third series one animal died within thirty-six hours after inoculation in spite of having received 0.5 c.c. of the serum subcutaneously at the same time. The other animal died within fifteen hours after the inoculation of the culture alone. In the fourth series the animal injected with the culture and 1 c.c. of the serum recovered, while the control animal died in eleven days. It would seem then that Class has established by these experiments another proof of the specificity of the micro-organism described by him.

The finding of the diplococcus scarlatinae of Class in cases of scarlatina has been confirmed by Gradwohl.¹ In seven cases that he examined he found the diplococcus in every case and at periods varying from the first week until convalescence. In four cases he claimed to have obtained the organism in pure cultures from the blood, while in one it was found in pure culture in the urine. He also confirms the experimental pro-

¹ Philadelphia Medical Journal, March 24, 1900, p. 683.

duction of scarlatina in swine, already attempted by Class, through inoculation into the vein of the ear of two young swine of cultures of the micro-organism. In one case the rash appeared eight days after the inoculation and was followed by desquamation. The animal recovered, but was killed and found at autopsy to have acute nephritis. The diplococcus scarlatinae was recovered from the blood and kidneys. In the second pig inoculated a rash appeared on the tenth day after inoculation.

In the corresponding number of PROGRESSIVE MEDICINE last year mention was made of the work accomplished by Class upon the etiology of scarlatina. Class¹ has contributed another article upon this subject, instigated by an announcement of the discovery by Baginsky and Sommerfeld of a micro-organism constantly present in the throat secretions and blood of scarlet fever patients. In his article he gives a description of the micro-organism which he had already described and compares it with the finding of Baginsky and Sommerfeld, showing that probably the latter authors had been working with the same organism which Class had discovered. He gives an interesting *résumé* of the confirmatory evidence as to the specificity of his micro-organism which has been adduced since his discovery, to which reference has been made in another place. After showing that the germ is pathogenic for various animals in different degrees, he states that symptoms and signs closely resembling those of human scarlatina are produced by the intravenous injection of a virulent culture of his diplococcus. The signs noted were diffuse reddening of the skin, lasting from one to two days, followed within a week to two weeks by profuse scaling. In one fatal experimental case the spleen was found enlarged and congested and the Malpighian bodies stood out prominently. There were a few small hemorrhages near the surface in the cortex; the pyramids stood out plainly; the renal pelvis was congested; there were necrotic areas in the congested liver; the lymph-glands of the neck were enlarged; there was a slight effusion between the layers of the pericardium, and the walls of the intestine were congested and showed numerous hemorrhagic spots. In other animals experimented upon the gross evidences of nephritis were usually present. From experiments made by him as to the influence of the blood of scarlet fever patients upon the activity of the germ, it would seem that he had proven the fact that the blood of a scarlet fever convalescent inhibited the growth of the diplococci on glucose-agar. The other points in his paper have been already alluded to or will be spoken of in connection with other articles.

Symptoms. Scarlatina miliaris is the subject of a paper by Griffith.² After reviewing the literature briefly four cases are reported, showing

¹ Journal of the American Medical Association, September 29, 1900, p. 799.

² Jacobi Festschrift.

this curious and puzzling variety of scarlatinal eruption. None of the cases mentioned seems to have been of much severity ; in fact, they are all rather mild instances of infection. The paper is of value in pointing out a fact that is frequently left unmentioned in descriptions of scarlet fever.

An interesting study of the rash of scarlatina has been made by Schamberg.¹ After describing the rash as it ordinarily appears and mentioning the appearance of "goose-flesh," the author lays some stress upon the significance of the presence of sudamina. He remarks that from his observation of several hundred cases of scarlet fever, particularly with a view to the solution of this question in regard to vesiculation, his opinion is that vesicles are present in the vast majority, if not in all, cases of scarlet fever, yet in a few sentences below his statement is modified by the occurrence of the following sentence : "In perhaps 20 per cent. of all the cases, and 50 per cent. of well-marked eruptions, vesicles are visible if looked for." In some cases he found vesicles in sections of the skin where the closest scrutiny of the body failed to detect their presence. Accompanying the paper is an excellent reproduction of a photograph showing a group of vesicles about the axilla, while other photographs illustrating desquamation both on the trunk and extremities accompany the article. The question of desquamation he believes to be directly proportionate to the amount of vesiculation. In his opinion too much stress is laid upon the occurrence of desquamation as an evidence of scarlatina, although he grants that the persistence of the scarlet fever desquamation and the character of it are of more diagnostic value. The histology of the skin in scarlatina is carefully studied on the basis of 400 sections made from thirteen specimens removed during life from twelve cases. His conclusions from his studies show that the skin lesion is an acute simple dermatitis, with dilatation of the bloodvessels, exudation of lymphoid cells, and polynuclear leucocytes into the papillary layer ; that the goose-flesh appearance is due not to the contraction of the hair muscles, but to extensive infiltration in and about the hair-follicles ; that the vesicles have their seat in the deeper layers of the rete or that they may be intrafollicular and are characterized by a lake of serum showing a leucocytic infiltrate ; and that the punctated spot was seen in several sections to be produced by a hair follicle surrounded by cell infiltration. An interesting point is that the changes occur more especially in the hair follicles, the epidermal cells of which are disintegrated by leucocytic infiltration, and their arrival at the surface occurs only after a considerable time because of the depth from which they are derived.

¹ Journal of the American Medical Association, November 10, 1900, p. 1199.

An interesting case of hemiplegia complicating scarlet fever has been reported by Bazin.¹ It occurred in a male child, aged twenty-one months, who had a severe attack of scarlatina, with delirium and an almost constant state of semi-unconsciousness. From the eleventh day of the disease pain in the head was complained of. On the fifteenth day convergent strabismus was noted and vomiting began. On the next day, the sixteenth of the disease, paresis of the right arm was noted. On the seventeenth day the child was unconscious, vomiting, presenting no strabismus, but with flaccidity of the right arm and leg and twitching of the left side. The head was deviated to the right, and there was slight facial palsy of the right side. The child improved, but was left with wasting of the right side with weakness, which disappeared in about ten months. Ferrier² reported two cases of scarlet fever with hemiplegia before the Société Médicale des Hôpitaux.

THE "FOURTH DISEASE."

Anyone who has had much to do with the treatment of children must have frequently felt how imperfect is our classification of the manifestations of constitutional and internal diseases on the surface of the skin, and how difficult it is at times to interpret the significance of various poorly defined eruptions. While it is acknowledged that r  theln is a distinct disease, having characteristics different from both measles and scarlet fever, and yet at times bearing a puzzlingly close resemblance to one or the other of these infections, the description of the course of the disease and of the eruption differs widely in different text-books. To anyone who has seen many cases of r  theln there must have occurred the idea which has been formulated and made distinct by Clement Dukes,³ in an article entitled "On the Confusion of Two Different Diseases under the Name of Rubella (Rose Rash)." With his opportunities for the study of the various infections at Rugby School, to which he is physician, Dukes has been able to make many valuable contributions to our knowledge of the incubation period, and symptomatology of many of the infections. His last contribution, to which reference has been made, is one of much value and should be read in detail by all those to whom the journal is accessible. Owing to the importance of this subject, not only from the stand-point of the scientific nosologist, but in a more practical way from the stand-point of the practising physician, because of the questions of isolation and prognosis, the article is considered worthy of full abstracting and a good deal of space. Dukes considers that under

¹ Montreal Medical Journal, vol. xxviii., No. 11.

² Abstract in Lancet, April 21, 1900, p. 1143.

³ Lancet, July 14, 1900, p. 89.

the name of rubella there are included two distinct diseases, one of which should be known under the name of rose rash, the other he calls tentatively the "fourth disease." The syndrome to which he gives this provisional name closely resembles scarlet fever, yet he emphatically states that the "fourth disease" does not develop into true scarlet fever, is a distinct entity, and may occur with scarlet fever. He then points out the great importance of the question of the differentiation of this "fourth disease," requiring a period of isolation of from fourteen days or less up to twenty-one days, from scarlet fever, isolation for which should be continued for from forty-two to fifty-six days. He considers that a mild epidemic of supposed scarlet fever that occurred in 1892-93 may have been composed of examples of this disease. Two school epidemics, comprising sixteen and twelve cases respectively, in which the illness resembled scarlet fever are mentioned, while he states that other epidemics which might be looked upon as a form of rubella resembling measles cannot be considered as of the same nature as this "fourth disease." Or, to put it in another way, rubella is a distinct disease, not only from measles and scarlet fever, but from the "fourth disease." The difficulties of the separation of the "fourth disease" from rubella are that the symptoms, aside from the rash, are similar; that in the same patient the eruption sometimes at first resembles measles, and later, by coalescence of the lesions, resembles scarlet fever; that the two diseases, rose rash and the "fourth disease," frequently occur epidemically at the same time and in the same locality, and that the period of incubation is almost the same for both. Dukes has seen, however, that an attack of rose rash does not protect against the "fourth disease," nor does the "fourth disease" protect against an attack of rose rash.

In an epidemic of thirty-one cases scarlatina and the "fourth disease" pursued their course at the same time with distinct differences between the two diseases. The epidemic is analyzed, showing conclusively the actual independence of the two infections. So important is this subject that a table showing the different characteristics of rubella, the "fourth disease," and scarlet fever is taken *en masse* from Dukes' paper. An abstract of the table would fail to present the subject in as clear a form, and it is felt that the differentiation of the three diseases is a matter of extreme importance :

THE DISTINGUISHING CHARACTERISTICS BETWEEN RUBELLA (ROSE RASH),
THE "FOURTH DISEASE," AND SCARLET FEVER.

Rubella (rose rash).	The "fourth disease."	Scarlet fever.
<p>1. <i>Premonitory symptoms.</i>—In many instances none; no headache; no vomiting; no catarrh; no cough; but frequent sore throat. If the attack be severe some malaise, anorexia, and drowsiness will exist.</p> <p>2. Its <i>season</i> is spring and summer.</p> <p>3. The <i>incubation period</i> is usually 18 days, but with a range of from 9 to 21 days.</p> <p>4. The <i>eruption</i> is usually the first noticeable symptom. Its appearance is that of minute rosy red dots, not patches. It shows itself first behind the ears and on the scalp and face, especially on the oral circle; from these situations it extends to the neck and the chest and ultimately covers the entire body. The minute dots become larger and gradually coalesce, forming patches of the bat's wing pattern, which so extend and alter in color as to be indistinguishable from measles.</p> <p>5. <i>The throat.</i>—The fauces look dry, with a dark, motley red hue.</p> <p>6. <i>The eyes.</i>—The conjunctivæ are pink-red and suffused.</p> <p>7. <i>The glands.</i>—The lymphatic glands throughout the body are enlarged, tender, and hard, like peas, notably the posterior cervical, the axillary, and the inguinal.</p> <p>8. <i>Desquamation.</i>—There may, perhaps, be a little branny desquamation, but frequently there is none.</p>	<p>1. <i>Premonitory symptoms.</i>—In many cases none, even with a copious eruption; neither headache, nor vomiting, nor catarrh, nor cough, but frequently slight sore throat. If the attack, however, be severe there may be pronounced malaise for some hours, with headache, anorexia, drowsiness, chilliness, and even considerable backache.</p> <p>2. Its <i>season</i> is spring and summer.</p> <p>3. The <i>incubation period</i> has a probable range of from 9 to 21 days.</p> <p>4. The <i>eruption</i> is usually the first noticeable symptom and will cover the whole body with a considerable diffuse rash in a very few hours. The hue is a bright rosy red and the eruption is raised somewhat from the surface of the skin. The sensation of heat of the skin to the touch, even where the rash is very full, is much slighter than in scarlet fever.</p> <p>5. <i>The throat.</i>—The fauces are usually swollen and reddish, assuming a velvety appearance, but this condition bears little relation to the extent of the rash.</p> <p>6. <i>The eyes.</i>—The conjunctivæ are pink and suffused.</p> <p>7. <i>The glands.</i>—The lymphatic glands universally are enlarged, hard, and tender, and feel like peas, though less manifest than in rose rash. Those mainly affected are the posterior cervical, the axillary, and the inguinal.</p> <p>8. <i>Desquamation.</i>—The desquamation may be slight, or as complete as possible, even extending to a general peeling of the hands and feet. But the desquamation bears no relation to the intensity of the eruption, for it often happens that a very full eruption may be followed by little or no desquamation, and what does occur disappears in a week or two. On the other hand, a full eruption may be attended by a general peeling as free as in the worst cases of scarlet fever, but mostly in small scales rather than in flakes or sheets. A slight rash is usually accompanied by little or no desquamation. But I have never seen a case of scarlet fever with a full eruption where the desquamation did not occur eventually in sheets, the process lasting many weeks. If a series of cases be observed these abnormalities will be very apparent.</p>	<p>1. <i>Premonitory symptoms.</i>—If the attack be slight the patient merely feels tired and usually complains of some amount of sore throat, headache, and chilliness; there may, however, be considerable malaise, with a genuine sense of illness, accompanied by some vomiting.</p> <p>2. Its <i>season</i> is autumn and winter.</p> <p>3. The <i>incubation period</i> is usually from two to three days, but with a range from a few hours to seven days; it very rarely extends beyond the fifth day.</p> <p>4. The <i>eruption</i> is diffuse, dusky red, papular in character, and originates behind the ears. It presents a goose-flesh appearance. It does not occur in isolated dots at any stage, nor in patches which are raised and have well-defined margins. It appears early about the clavicles and on the chest and the covered parts of the body. The rash is rarely so full at an early period as in the fourth disease and the skin is markedly burning to the touch.</p> <p>5. <i>The throat.</i>—The appearance of the fauces may vary from the most insignificant affection to an intense dusky redness, with marked swelling, showing sometimes white spots of inspissated secretion; and the severity of the throat affection bears usually a distinct relation to the skin eruption.</p> <p>6. <i>The eyes.</i>—Normal.</p> <p>7. <i>The glands.</i>—The lymphatic glands of the throat and neck can scarcely be detected during the first few days; but subsequently they may be enlarged in proportion to the severity of the faucial affection. This, however, creates no difficulty, as the axillary and inguinal glands are not so involved as in rose rash.</p> <p>8. <i>Desquamation.</i>—The desquamation always bears a ratio to the extent of the eruption. A copious eruption signifies a free desquamation, while a scanty eruption is followed by a sparse peeling, which, however, does not cease for many weeks. It commences invariably by a peeling of the tongue on the fourth day, which extends to the lips, and is followed by peeling of the face and behind the ears: one of the easiest places in which to detect the desquamation early is the ear. The desquamation occurs in pieces or shreds rather than scales, and is very free about the hands and feet, lasting for many weeks. At the commencement of the peeling circles of desquamation are formed around the raised papillæ, though I have once seen this state in the "fourth disease" where the peeling was excessive.</p>

Rubella (rose rash).	The "fourth disease."	Scarlet fever.
<p>9. <i>The kidneys.</i>—They are rarely affected, and then only with a trace of albumin.</p> <p>10. <i>Sensations of illness.</i>—Even with a full eruption as intense as in measles the patient usually states that he does not feel ill, although there may be other indications to the contrary.</p> <p>11. <i>The tongue.</i>—It is clean or slightly furred and never coated with a thick, white fur which peels on the fourth day.</p> <p>12. <i>The pulse.</i>—It is normal or slightly increased in frequency, but always bearing a ratio to the temperature.</p> <p>13. <i>The temperature.</i>—This varies from normal to 103° or 104° F.</p> <p>14. <i>The course of illness.</i>—The symptoms, however severe, disappear in a few days, leaving comparatively little feeling of illness; where the eruption is slight there may be no illness whatever.</p> <p>15. <i>The period of infection.</i>—I do not know any illness which is so infectious in its earliest stage, even before any symptoms are manifest. It results from this cause that schools suffer to so great an extent from the disease when once it has found an entrance. It is less infectious in its later stage.</p> <p>16. <i>Protection.</i>—The attack affords no protection against measles, the "fourth disease," or scarlet fever.</p> <p>17. <i>The duration of infectiveness.</i>—From 10 to 14 days where efficient disinfection is in force.</p> <p>18. <i>Sequelæ.</i>—Practically none.</p> <p>19. <i>Termination.</i>—Usually complete recovery in a fortnight.</p>	<p>9. <i>The kidneys.</i>—Rarely affected; where they are involved the condition is probably that only of the albuminuria of adolescents.</p> <p>10. <i>Sensations of illness.</i>—Where the eruption is slight there is no illness of any kind, and where the eruption is copious the feeling of illness is sometimes scarcely apparent, although I have seen boys really ill from this disease.</p> <p>11. <i>The tongue.</i>—The tongue is clean or slightly furred and never coated with a thick, white fur which peels on the fourth day, leaving the tongue raw.</p> <p>12. <i>The pulse.</i>—In slight cases it is normal and where the case is a well-marked one the pulse is quickened, but bears a ratio to the temperature; that is to say, where the pulse is accelerated the temperature is raised in a proportionate degree.</p> <p>13. <i>The temperature.</i>—This varies from 98.4° to 103° or 104° F.; but even with a very extensive rash the temperature is not necessarily high.</p> <p>14. <i>The course of illness.</i>—The symptoms however severe pass off in a few days, leaving comparatively little feeling of illness.</p> <p>15. <i>The period of infection.</i>—It is not so very infectious in its earliest stage. In its later stage, even while desquamation is taking place, it is not infectious beyond two or three weeks after thorough disinfection.</p> <p>16. <i>Protection.</i>—The attack affords no protection against scarlet fever or rose-rash.</p> <p>17. <i>The duration of infectiveness.</i>—From 10 to 14 or even 21 days where efficient disinfection is in force.</p> <p>18. <i>Sequelæ.</i>—Practically none, but I have seen the submaxillary glands enlarged.</p> <p>19. <i>Termination.</i>—Usually complete recovery in a fortnight.</p>	<p>9. <i>The kidneys.</i>—Albuminuria is very frequent. The liability to acute nephritis is very decided unless the treatment be appropriate.</p> <p>10. <i>Sensations of illness.</i>—In slight cases there is no apparent illness, but I have never seen a case with a severe eruption where the patient was not really, and also sensibly, very ill.</p> <p>11. <i>The tongue.</i>—If the case be slight there may be no early signs, but in a well-marked case the tongue is coated with a thick white fur which, peeling off from the tip and edges on the fourth day, gradually leaves a raw, red tongue, commonly termed the "strawberry" tongue.</p> <p>12. <i>The pulse.</i>—Even in slight cases the pulse is accelerated, and in severe cases very greatly quickened and always out of all proportion to the height of the fever; that is to say, even with a temperature only just above normal (99° F.) the pulse will be very rapid (120).</p> <p>13. <i>The temperature.</i>—This varies from 99° to 106° F., but is never increased in the usual ratio to the pulse. A full rash always means a high temperature.</p> <p>14. <i>The course of illness.</i>—The illness gradually subsides in from four to seven days. Desquamation commences as eruption fades and continues for from six to eight weeks or more, and lasts longest on the hands and feet.</p> <p>15. <i>The period of infection.</i>—This disease is the least infectious of any illness during its early stage. It therefore allows time for quarantine and isolation, and thus can be controlled, so that an epidemic may be prevented more readily than in any other infectious illness. After the first forty-eight hours the infection is very powerful, but I am not prepared to pronounce upon its duration. Until this can be ascertained the only safe rule is the assumption that it may last as long as desquamation itself, although I am quite clear that this is inaccurate.</p> <p>16. <i>Protection.</i>—An attack affords no protection against the "fourth disease" or rose rash.</p> <p>17. <i>The duration of infectiveness.</i>—From six to eight weeks or more—<i>i. e.</i>, when the desquamation has ceased. But I am far from believing that the infection lasts so long after efficient disinfection, though at present I can adduce little proof.</p> <p>18. <i>Sequelæ.</i>—Nephritis; suppuration of the submaxillary lymphatic glands and others; otitis; rheumatism; endocarditis.</p> <p>19. <i>Termination.</i>—Usually complete recovery ensues, but sometimes a prolonged convalescence on account of the sequelæ; but the disease shows a high mortality in the very young.</p>

Rubella (rose rash).	The "fourth disease."	Scarlet fever.
<p>20. <i>Treatment</i>.—The patient requires about five days in bed, followed by three days indoors; then about six days in the fresh air; and after complete disinfection he may safely mix with others.</p> <p><i>Abortive cases of rose rash are frequent and are responsible to a large extent for the spread of this disease. The difficulty is to grasp them, as no actual illness occurs.</i> 1. <i>Pink eyes</i>.—There is a group of cases of epidemic roseola which have no symptoms that I have yet ascertained except pink conjunctivæ. And these cases, while capable of passing the illness on to others, are immune against a subsequent attack themselves.</p> <p>2. There is another group of cases of epidemic roseola which I believe—but I cannot at present advance beyond belief, for I have not yet satisfied myself by actual proof—may occur without showing any symptoms beyond slight feverishness and enlargement of the lymphatic glands throughout the body.</p>	<p>20. <i>Treatment</i>.—The patient may be permitted to get up on the fifth or sixth day or as soon as his strength permits, irrespectively of the desquamation and without danger from sequelæ. He then requires three or four days indoors, followed by five or six in the fresh air, and may safely join his school-fellows at the end of from 14 to 21 days, notwithstanding desquamation, provided the disinfection has been thorough.</p>	<p>20. <i>Treatment</i>.—Every case of scarlet fever, however slight, requires 21 days of absolute confinement to bed. The patient should be clothed in a flannel night-shirt and the skin daily greased with carbolic or eucalyptus oil. No food should be given for the first week except milk and farinaceous food, however mild the illness, in order to guard against nephritis. The patient should not be permitted to join his friends for six or eight weeks, but I do not think it essential to isolate cases until all desquamation has ceased from the hands and feet, for this process sometimes occupies several additional weeks. I have acted on this assumption for many years without harm, even transferring boys to their own homes. Of course, complete disinfection is imperative.</p>

In the epidemic of thirty-one cases mentioned above there were seen instances of scarlet fever alone, of the "fourth disease" alone, of scarlet fever followed by the "fourth disease," and of the "fourth disease" followed by scarlet fever. An instance is given also of the case of a boy who had had scarlet fever six years before the occurrence of an attack of the "fourth disease." In order to show that there is an essential difference between these diseases and rubella, Duker mentions an epidemic of the "fourth disease" where almost one-half of the patients had previously suffered from rubella. The following points, while many of them are mentioned in the table given above, might be enumerated:

Premonitory symptoms were slight and only spoken of on inquiry. Apparently but one case had vomiting. The first symptom was the rash, which was very full and characteristic of scarlet fever. Desquamation varied from mere roughness up to peeling to the extent equal to the worst case of scarlet fever, although in most instances there was free desquamation of small scales. He states that peeling may continue as long as in scarlet fever, although it is apparently innocuous. The tongue was furred throughout, and did not peel on the fourth day, as does the tongue in scarlatina. The lymphatic glands were universally affected, but not so markedly as in rubella. The temperature ranged from 99.4° to 104.2°, the average being 101°. The pulse never reached 100. Albuminuria occurred in none of the cases. The incubation period is supposed by him to vary from nine to twenty-one days, although this

point has not been definitely determined. The duration of infectiveness is believed to last from ten to fourteen days or even twenty-one days.

In the *Lancet* of July 28, 1900, Dukes' conclusions are confirmed by Broadbent, Rutter, and Johnstone. Johnstone mentions two cases where the diagnosis of mild scarlet fever had been made in cases which he believes to have been instances of this disease. On removal to isolation hospitals they both contracted scarlet fever while in the institutions. Dukes' article was the cause of a letter in the last-named number of the *Lancet* from Walton, in which he states what should be more insisted upon than is usually the case, namely, that free desquamation does not establish the diagnosis of scarlet fever.

Robert Craik has contributed an account of four cases which has a distinct bearing upon this question. The first case occurred in a child who awoke one morning with a rash and slight fever. The rash superficially resembled scarlet fever, and the case was looked upon as an instance of that disease by a physician seeing the case with Craik. During the course of the third week a fine, mealy desquamation was noted on the legs, but not on the hands or feet. At this time the younger children in the family were several times exposed to the infection, yet none contracted the disease. About a year later the patient had a typical attack of measles, and two months after this last attack he passed through an attack of German measles. Three other cases were children in one family showing a scarlatina-like eruption early in the course of a feverish attack. After none of them was there any desquamation. However, it is to be noticed that although Craik states that for several reasons he thinks that they had not scarlet fever, these three children were exposed to the infection of scarlatina at the hospital to which they were sent, and yet none of them developed this latter disease. Following the incidence of these cases an epidemic of typical German measles attacked the village. It can be said from the account published that these may have been true instances of the condition which Dukes has given the name of the "fourth disease;" in this case the succeeding epidemic of German measles which occurred in the village would have to be looked upon as a mere accidental association.

VACCINATION.

At the present time an absurd hue and cry is being raised against vaccination by a set of fanatics incapable of forming an opinion upon this question and probably upon any other. Those of us who know the facts are convinced that the claim that "loathsome diseases" are produced by vaccination, even with the calf lymph, is perfectly absurd,

except where the person doing the operation is culpable as regards the cleanliness of his hands, instruments, and dressings. Inasmuch, however, as the claim has been made that vaccination and syphilis are the same disease, and that the former can be transmitted by means of the calf lymph, the experimental work of Ravenel¹ is very timely. Two heifers were selected as subjects for the operation, and the material inoculated was obtained from highly infective lesions. The results were absolutely negative, both as regards the gross lesions, the clinical course, examination after death, and examination of stained portions of the nervous system for evidence of successful inoculation with syphilis.

An interesting report upon the use of glycerinated calf vaccine lymphs by the "*Lancet* Commission" is given in the *Lancet* of April 28, 1900, p. 1227. For the figures in regard to the various brands of lymph examined the original report should be consulted. In this place it is only necessary to give the conclusions at which the Commission arrived:

"1. During the last three years there has certainly been a marked general improvement in the character of the lymph supplied from various sources.

"2. The 'extraneous' bacteria have not yet been brought down to a constant quantity, and very few of the 'brands' that were examined, even allowing for accidental contamination in those cases where only three or four colonies were found, were sterile on all occasions. Certain brands, however, were superior in this respect to others.

"3. From a consideration of those brands that were examined and re-examined we were compelled to come to the conclusion that in certain instances the process of glycerination had been imperfectly carried out. It may be that the lymph had not been stored sufficiently long after being glycerinated, or, on the other hand, that the mixing had not been sufficiently well carried out, or too small a quantity had been used.

"4. In a few cases, as will be readily gathered from the tables, the collection of the lymph had not been carried out under sufficiently strict conditions of cleanliness and with proper antiseptic precautions, the presence of a comparatively large number of sporulating and anaërobic organisms giving evidence of such laxity.

"5. The presence of a large number of organisms on the agar plates affords evidence that sufficient precautions had not been taken to remove the organisms usually found on or in the appendages of the skin, and we suggest that special attention be paid to this point.

"6. Where the glycerination is properly carried out there appears to be little danger of the occurrence of active tubercle bacilli in vaccine lymph. We are glad to see, however, that most of those who send out

¹ Proceedings of the Pathological Society of Philadelphia, March, 1900.

vaccine lymph make a point of having a post-mortem examination made of the carcass of the calf before the lymph is distributed for use.

“7. The use of calf lymph entirely does away with any danger of the transmission of syphilis through the agency of vaccine matter. The presence of a small quantity of blood, therefore, is not considered to be of any importance, except, as we have pointed out, that it indicates that perhaps more care might have been taken in the collection of the sample. It may, however, be pointed out that it has been proved by recent experiments that the presence of blood, even in small quantities, in vaccine lymph exerts a marked deteriorating influence. The lymph rapidly loses some of its potency, the activity falls more rapidly, and extraneous organisms develop more readily than in lymph so collected that it is not tinged with blood.

“8. We are strongly of the opinion that no sample of lymph should be sent out from the makers until it has been under the action of glycerin for a month, except for purposes of export or when supplied to those vaccination officers who understand the action of the glycerin and of the necessity for allowing it time to exert its full power of eliminating all ‘extraneous’ organisms.

“9. A bacteriological examination should be made of every batch of lymph that is sent out, and not only the percentage of insertion successes should be given, but the number of organisms, both aërobic and anaërobic, spore-bearing and non-spore-bearing, with the time at which the test was made, should be marked on every tube or set of tubes.

“10. We are thoroughly satisfied that, so long as the non-spore-bearing organisms are eliminated and the spore-bearing and anaërobic organisms reduced to a minimum, it is not necessary to send out absolutely sterile lymph. These spore-bearing and anaërobic organisms are—except when the lymph is taken from diseased animals, which should never be the case—entirely innocuous, and it is far better to recognize this fact than to make a pretence of sending out sterile lymph which in many cases has never been ‘plated’ for organisms at all.

“11. It should be recognized that the less there is left for the glycerin to do the better and more permanent will be the quality and action of the vaccine lymph. With healthy animals great cleanliness, strict anti-septic precautions in regard to the skin, the hands of the operator, the instruments, and the capillary tubing, the fewer will be not only the organisms that may be eliminated by glycerin, but also the spore-bearing aërobic and anaërobic organisms.

“12. Taking them as a whole, the vaccine lymphs, as already stated, are of much greater purity than we expected to find them. Improvements had already been made at the time that the first experiments were systematically carried out, while from our later examinations it is

evident that still further improvement has been made during the past year."

Accidental Eruptions. The artificial production of any surface lesion can, of course, be followed by infection, with resulting manifestations in the skin. The infrequency of cutaneous evidence of septic absorption after properly performed vaccination is rather remarkable when we consider for how long a time there is present on the surface a breach of continuity. The occurrence of an eruption after vaccination makes one always think of possible faults in protecting the pustules from secondary infection. In spite of all care, however, and frequently with absolutely no evidence of secondary infection by micro-organisms, lesions of various forms will manifest themselves on the skin, and these may occur without evidence in the local appearances that any virus except that purposely introduced has gained access to the tissues.

In a study of vaccination eruptions by Jacob Sobel¹ he states that many patients under his observation showed that the eruption generally appeared between the ninth and fourteenth days, and frequently on the tenth or twelfth day after the operation. Some were noted as occurring as early as the fifth day, while others did not appear until five weeks after vaccination had been performed. Erythematous, urticarial, papillar, vesicular, multiform-erythematous, morbilliform, bullous or pemphigoid, and scarlatiniform types of eruption were seen. One of these types was seen in about 14 per cent. among 583 cases. Among these the most frequent type was the urticarial, sometimes localized to the vaccinated arm, sometimes diffuse. In some of the cases the eruption was very suggestive of varicella, and could only be differentiated from that disease by the fact that the lesions did not come out in stages, were lacking in the ordinary grouping seen in varicella, seldom occurred on the mucous membrane of the mouth, and that their contents were darker than that seen in chicken-pox. The scarlatiniform eruptions were seen in only four cases in the total number—a proportion that would seem rather small were the lesions looked upon as due to septic infection. The vaccinations were generally made with ivory points.

SMALLPOX.

Treatment. The use of salol in the treatment of smallpox is the subject of a paper by Biernacki and Jones,² according to the method advocated by Beg. Seven cases formed the basis of the paper. Salol is presumed to act not so much upon the specific hitherto undiscovered cause

¹ Medical News, August 11, 1900.

² British Medical Journal, June 2, 1900, p. 133.

of smallpox as upon the micro-organisms which secondarily infect the vesicles and produce pustulation, with its attendant scarring. The drug is used in doses of 60 grains daily. As the result of their eight cases in which this treatment was used they conclude that salol may practically avert general pustulation "and even have a partial abortive effect when given after maturation has commenced." It almost invariably hinders pustulation, even if it fails to produce the partial abortive effect mentioned. "The cutaneous inflammation is slight and irritation commonly absent, even in confluent cases." Scarring is said to be inconsiderable and often absent, while the scabs quickly drop off. The secondary fever due to absorption from the pustules, which according to the view presented in the paper are not really a part of the disease, but are due to secondary infections, is either absent altogether or very slight. The results which they have obtained certainly warrant a further use of this method of treatment. If salol, or one of its antiseptic constituents, is found to be eliminated, either unchanged or in a form still active, by the skin the plan would have a good theoretical basis.

MALARIA.

Etiology and Prevention. Patrick Manson¹ has communicated the results of an experiment calculated to definitely prove the transmission of malaria by mosquitoes. Owing to the previous experiments performed by Grassi and Bignami (the experimental inoculation of healthy human beings through the medium of the mosquito) being open to the objection that they were made in Rome—an undoubtedly malarial district—he had forwarded to him from Rome relays of mosquitoes infected with the benign tertian parasite. After feeding them upon the blood of patients with the latter form of malarial infection they were shipped to London. P. Thurburn Manson allowed the mosquitoes to bite his hands, which were inserted into the cage in which they accomplished their journey. The subject of the experiment states that he was perfectly healthy and had never been abroad since the age of three years, nor at any time in any malarial region in Great Britain. Numerous consignments of mosquitoes were tested, but apparently only the third consignment, which arrived on September 10th, was productive of any result. These mosquitoes had been infected from a case of simple tertian ague in Rome on September 6th and 7th. Twenty-five mosquitoes bit Manson on September 10th and ten others on the 12th. Although previously feeling perfectly well, he on the morning of the 13th arose

¹ *Lancet*, September 29, 1900, p. 923.

feeling languid and out of sorts, with a slight rise in temperature (99° F.). By midday he was chilly, and in the middle of the afternoon went to bed with general aching, lassitude, and chilliness, and a temperature of 101.4° F. Examination of the blood failed to show any parasites. On the next day the temperature continued elevated, the other symptoms were aggravated, but several examinations of the blood failed to reveal the presence of the malarial parasites. On September 15th parasites were still absent, but early in the afternoon he became chilly, and later hot and restless, the temperature rising to 103.6° , with some delirium. On September 16th he awoke feeling well and with a normal temperature. Out of several blood examinations one half-grown tertian parasite was found. In the evening there was a recurrence of the fever, with sweating. On the next day (September 17th) several half-grown parasites, a gamete, and two pigmented leucocytes were found in the first blood film examined, and during the day many tertian parasites were found. Although his temperature was only 99° in the morning, at 2 P.M. he had chilly sensations, with a slight rise of temperature, and by 5 P.M. the latter had reached 103° . Copious sweating occurred, and the edge of the spleen could be felt on deep inspiration. By 9 P.M. the temperature had fallen almost to the normal point, and he was feeling better. Quinine was given that night and on the next day, a few parasites being found in the blood during the forenoon and afternoon of the latter. After taking quinine the malarial manifestations ceased and the parasites disappeared from the blood.

This experiment is quoted here in detail because it is felt that it is one of extreme importance as a confirmation of the mosquito-malarial theory. It therefore certainly deserves extended mention in the summary of the year's work upon this timely topic.

The experiment suggested by Manson of building in the Roman Campagna a hut capable of being made mosquito-proof, has been carried out perfectly successfully up to September 21st. Drs. Sambon and Low, Senor Terzi, and two Italian servants had lived in the hut from early in July up to that date perfectly free from malaria, although living in the midst of the region where practically everyone suffers from the disease. Protection from mosquitoes by netting-wire screens at doors and windows, with mosquito nets around the beds, and with care as to the staying out-of-doors between sunset and sunrise in order to avoid the bite of the anopheles have, then, been successful in preventing the occurrence of malaria without any other prophylactic measure being adopted. The value of these experiments can hardly be exaggerated.

An experiment similar to that suggested by Manson has been reported

by Eugenio di Mattei.¹ Five persons, including the reporter, lived in a hut thoroughly protected from mosquitoes for thirty-two nights without contracting malaria, although workmen living in the neighborhood and not protected from mosquitoes suffered from grave forms of malaria. During the course of the experiment no quinine or other drug was taken.

In an article upon the inoculation theory of malarial fever Woldert² has studied the distribution, both geographical and seasonal, of mosquitoes, especially in connection with the neighborhood of Philadelphia. With his own specimens of *culex*, obtained in the neighborhood of the latter city, he has united the observations of the finding of full-grown mosquitoes by others in the northern part of the United States, and shows that they have been found during all of the months from September until May, while their presence in the summer months needs no scientific demonstration. All of the examples found were females. On a small scale Woldert has tested the power of certain culicidal substances. They were as follows: A strong solution of tobacco (120 grains of tobacco macerated for twenty-four hours in an ounce of kerosene oil), saturated solution of camphor in kerosene oil, saturated solution of naphthalene in kerosene oil, and, finally, kerosene oil alone. Pupæ of the *culex* *pungens* were put in glass jars holding a half-gallon. One drop of the tobacco solution in oil floated on the surface of the jar produced no effect at the end of eight minutes, but by the addition of three more drops of the solution all the pupæ were dead at the end of one hour. The solution of camphor in oil seems to have acted rather more promptly, and the addition of four drops to a half-gallon of water caused the practical death of the pupæ at the end of thirty-five minutes. Very much the same result was obtained with the solution of naphthalene in kerosene oil. Similar results were obtained when kerosene was used alone. By using only one drop of the various solutions to the half-gallon of water and allowing a longer time to elapse for the experiments it was found that the solution of tobacco in oil killed the pupæ within two hours, while the other solutions and plain kerosene had no effect during the same time. Experiments with larger quantities of water had the same result. Woldert concludes that to an acre of water from 44 to 60 ounces of the solution of tobacco in kerosene should be added in order to kill mature pupæ.

An experimental investigation on quite a large scale has been made by Fermi and Tonsini³ on the island of Asinara. This island lies to the north of Sardinia, and would appear to be quite malarial. Eleven

¹ *Archivo per le Scienze Mediche*, 1900, vol. xxiv., No. 2; Abstract in *New York Medical Record*, September 5, 1900. p. 418.

² *Journal of the American Medical Association*, October 13, 1900, p. 933.

³ *Zeitschrift f. Hygiene und Infectionsk.*, 1900, Band xxxiv., Heft 3, p. 534.

foci for this infection were found on the island, in six of which malaria was seen in severe form. Among eighteen specimens of water it was found that exactly one-half contained the larvæ of mosquitoes. Seven buckets and watering troughs ("kübel" and "tränken") examined were found to contain a large number of larvæ, in the former of which especially those of anopheles were found. In the bodies of water the attempt was made to cause the disappearance of mosquitoes by destroying the larvæ through the use of petroleum spread over the surface twice a month from June to November, while buckets and troughs were emptied every ten or fifteen days. For the destruction of mosquitoes in the houses various powders, including those of chrysanthemum and the zanzolina of Celli and Casagrande or chlorine gas, were used, while mosquitoes were excluded from the houses by various mechanical devices. As a result of these measures it was almost impossible to find anopheles in any house, and the number of culex was very much diminished. During this time no primary malarial attack occurred, while in 1898 to 1899 there were forty cases which had undoubtedly developed in the island.

The translation by Brock¹ of an article by Bastianelli and Bignami upon malaria and mosquitoes has many points of interest in regard to this topic. The failure in some cases to infect the anopheles with tertian and semilunar parasites from certain patients is accounted for by them in the case of the semilunar bodies by these being possibly not mature or having grown too old in their human host to develop in the insect. Again, they think it possible that some of the mosquitoes may possess immunity against the infection. The failure to obtain infection of the anopheles in all but two patients suffering from quartan malaria was supposed by them to be due to some variation in the external conditions surrounding the insect. For this reason they tried making use of patients who had been suffering from the infection at various times and also keeping the mosquitoes at different temperatures. With recent quartan cases, and those having suffered from the quartan form of malaria for many months, infection of the mosquito was not obtained, even though the insects were kept at various temperatures. However, with very old quartans, one of whom is stated to have had his infection for about a year, eight mosquitoes kept in a warm temperature (22° C.) became infected out of fifty-six insects with which they experimented. Their observations upon the development of the semilunar bodies show the following steps: In the intestine of the anopheles flagellæ formed very quickly. The impregnated macrogametes, after ten or twelve hours, show the formation of a round hyaline body in

¹ Lancet, January 13, 1900, p. 79.

one portion of the parasite, while the pigment is collected at another. From the hyaline portion a process is formed which lengthens out and either remains straight or becomes hook-shaped at its free extremity. The spherical hyaline body grows less in size as the cylindrical process develops, until finally the sphere entirely disappears and a complete vermicule is formed. During this process the pigment migrates toward the cylindrical prolongation, and in the final stage of the vermicule is found near to its pointed extremity. From their experiments they conclude that the same species of mosquito becomes the host of all of the forms of malarial parasite and transmits again to the human being the same form of parasite with which the insect itself was inoculated. Another point which they consider proven is that the same infected mosquito may inoculate by successive bites several people, from the fact that the salivary glands may become charged anew with the parasite after the first charge has been exhausted upon a human being. They also state that the same mosquito may harbor two kinds of parasite, and may thus by a single bite produce a double infection in a human victim. From their study of the larvæ of the anopheles as they occur about Ostia they conclude that in order to prevent the mosquito from flourishing the vegetation should be removed from the water and the latter should be kept in more constant agitation. Their views in this respect are based upon the fact that in the neighboring canals larvæ were more abundantly found where there was vegetation present in the water and where the latter was almost if not quite still.

Charles F. Craig¹ has contributed a paper upon the tertian and quotidian æstivo-autumnal parasites, his observations tending to confirm those of Marchiafava and Bignami in regard to the existence and significance of these two forms in the irregular continued malarial fevers, with quotidian and tertian exacerbations respectively. He considers that there are two distinct types of infection, and points out that the temperature curve of the tertian æstivo-autumnal type is peculiar and distinctly characteristic. Inasmuch as the greater number of mistakes in diagnosis occur in the æstivo-autumnal rather than in the ordinary quotidian and tertian malarias, with complete subsidence of temperature during the intermission, studies such as these are of particular value, and the original paper should be consulted for study of the temperature-chart of several cases and a description of the parasites in their minuter details. Of course, the finding of the parasite of either form prevents the error of looking upon these cases as cases of uncomplicated typhoid fever, tuberculosis, endocarditis, etc. The differentiation of the two forms of the æstivo-autumnal parasite is of much interest from a scientific

¹ Journal of the American Medical Association, November 3, 1900.

stand-point, and may lead to more substantial results when their life-history is still further worked out.

Nervous Complications. An interesting communication upon the relation of malaria and general paralysis has recently been contributed by Marandon de Montyel.¹ Four cases of general paralysis following an attack of acute malarial poisoning are recorded. The first case developed symptoms of a nervous trouble immediately after a pernicious attack of malarial fever of the cerebral form, in a patient who had previously had syphilis. The nervous trouble was progressive, and death occurred a little over a year after the malarial attack. At autopsy there were found the classical lesions of general paralysis.

The second case was one aged twenty-nine years, and in whose family history nothing pertinent was present. He fell from his horse in October, 1884, alighting on his head and losing consciousness. Following this he had headaches easily induced by brain work. In the following spring he had for two months violent tertian ague, with some cerebral symptoms. Immediately after this his character changed, and he developed typical symptoms of general paralysis, which constantly progressed until his death, about three years after his attack of malaria, from paralytic marasmus. At autopsy the classical lesions of general paralysis were demonstrable. It was pointed out that the malaria in this case, as in the first one mentioned, may have been the immediate exciting attack of the nervous symptoms, which were in the first case indirectly due to syphilis, and in the second were due to an injury to the head.

The third case was a young man with neuropathic heredity and poor mental development. Seven years before the onset of his nervous symptoms he had had syphilis. In February of the year in which he came under observation he had tertian ague, which persisted for one month. At this time the evidence of general paralysis began. The second attack of ague occurred in April and was accompanied by severe cerebral trouble. This second attack seemed to still further advance the symptoms and signs of the general paralysis. In October of the same year he again had a development of malarial paroxysms yielding to quinine. Death from paralytic marasmus occurred in September of the year following his first attack of malaria. In each case it seems from the account as though the malarial attack had distinctly aggravated the nervous malady.

The fourth case was also a young man, being aged only twenty-eight years, who in June, 1885, suffered from insolation. From that time he had suffered from frequent violent headaches. In September of the same year he had an attack of quotidian intermittent fever, lasting for twelve days. Two months later he had intermittent fever for almost a

¹ Rev. de Méd., November 10, 1900.

whole month. From this time mental impairment was noticed. In the following March a third attack of intermittent fever, still of the quotidian type, appeared, and the intellectual disturbance increased. When he was seen in the latter part of April he showed well-marked evidences of generalized progressive paralysis. In commenting on the case the authors of the paper show that possibly after the first, certainly after the second, malarial attack the first intellectual troubles showed themselves, and that it was after his third manifestation of malarial poisoning that the physical signs of general paralysis appeared.

Four cases of progressive paralysis following chronic malarial infection are also recorded. The first of these cases had had syphilitic infection twenty years before coming under observation. Nine years later he had intermittent fever, which had continued with only slight intermissions until the time of his coming under observation. After the death of his wife he became gloomy, but apparently it remained for an acute exacerbation of his chronic malarial infection to hasten the progress of the mental symptoms. After this attack he totally lost his memory, and his speech became impaired. This case alone would not be sufficient to prove the connection of the two diseases—malarial infection and the general paralysis—but taken in connection with the others reported it is certainly strongly suggestive of the dependence of the latter upon the former. The second case following chronic malaria occurred in a man who had been suffering from this infection for six years, more or less, when, after an altercation, agitation with delusions of grandeur appeared. This altercation occurred after he had been for many years suffering from malarial manifestations. The clinical picture of general paralysis became more and more complete until his death, eighteen months after the first onset, when autopsy confirmed the clinical diagnosis.

His next case much resembled this one except for the apparent hereditary predisposition. Many years before coming under observation he had had a severe attack of violent malarial fever, and later contracted syphilis. Shortly after an attack of autumnal malaria a change in his disposition was noted, with some loss of memory. In the following spring another attack of malarial infection occurred, and the mental symptoms promptly increased. From this time the nervous disease steadily became more marked until his death. At autopsy the usual lesions of general paralysis were found.

The fourth case of general paralysis following chronic malarial poisoning had for sixteen years suffered from the latter trouble. At the age of thirty-nine years the prodromic symptoms of general paralysis appeared, consisting of loss of memory and lack of power in associating ideas. The return of his malarial manifestations, with cerebral con-

gestion, increased this trouble, so that he rapidly became completely demented and with confirmed general paralysis, from which he died within a year.

The conclusions of the authors are that an acute malarial infection can cause progressive general paralysis or general pseudoparalysis in those predisposed; that chronic malaria can occasion progressive general paralysis not only in those predisposed thereto, but probably also, although exceptionally, among those not so predisposed; that malarial manifestations occurring in the course of progressive general paralysis are frequently complicated by cerebral congestion, which aggravates the nervous disease, and that the progressive general paralysis occurring under the influence of acute or chronic malarial poison has almost always a rapid evolution.

Spiller¹ has recently reported a case of malaria presenting symptoms of disseminated sclerosis, in which autopsy showed that the small vessels throughout the brain and cord were filled with malarial parasites. During life the patient had had transitory paresis of the right half of the body, followed in four years by a similar affection of the left side. Aside from the finding of the parasite in the bloodvessels of the nervous system, there was found partial sclerosis of the motor tract leading from the left hemisphere, which could be traced upward into the internal capsule. He believes that the sclerosis of the motor tract was probably due to the occurrence of small hemorrhages, many recent instances of which Spiller found within the left internal capsule and in many parts of the cerebral cortex.

One other case is briefly mentioned which showed transitory signs and symptoms of ataxia during the course of an acute malarial infection.

Acker² has reported two cases of malarial coma in children. The first was a negro, aged eleven years, who had been unconscious for three days before admission. When brought to the hospital he was comatose, with tonic spasm. Soon after lumbar puncture was performed, without obtaining any fluid, the child became relaxed and unconscious. On the next day the æstivo-autumnal parasite was found in the blood. Two days after admission a chill occurred, and after this the child was comatose for two hours. Three days after this attack there was a return of slight rigidity.

In the second case the diagnosis of malarial coma is, as the author points out, somewhat doubtful, inasmuch as albumin and casts were present in the urine and convulsions were present at various times after admission. The presence of these evidences of renal disease

¹ American Journal of the Medical Sciences, December, 1900.

² Archives of Pediatrics, November, 1900,

render the respective parts played by uræmia and malaria somewhat difficult to determine.

Treatment. In the recent excellent work of Celli, the second Italian edition of which has just been translated by Eyre into the English language, the question of the natural history of malaria has been brought up to the present time. In last year's volume of *PROGRESSIVE MEDICINE* the best time for the administration of quinine was considered, particular reference being made to the view that the drug should be given immediately after the paroxysm. Celli states (p. 191) that in the severe fevers quinine should be given at once in a dose of 2 grammes, but that in the milder cases the giving of the dose immediately after the ending of the attack in the sweating stage will prevent the occurrence of another paroxysm, and advises that this time should be selected if it is permissible to wait, inasmuch as the stomach at this time tolerates the drug better and the latter acts at a time when the young organisms are in the red blood-cells. Celli differs from Koch in regard to the possibility of certain disinfection of the blood in all cases by the prophylactic use of quinine.

TYPHOID FEVER.

Relationship of Domestic Animals to the Disease. The relation of the domestic animals to the occurrence or possibly the causation of typhoid fever is one of considerable importance. William Royal Stokes¹ instituted a series of experiments in order to determine whether typhoid bacilli can pass through the intestinal canal of animals with preservation of their life and virulence. After an interesting review of the literature as to typhoid fever in animals and the experimental production of the disease in them, he records five series of experiments in which he used the medium of Hiss for obtaining plate-cultures from the stools of animals. His first series consisted in feeding two dogs, two white rats, and one six-weeks-old calf. Only once did he succeed in obtaining a growth of the bacillus coli communis, and obtained no typhoid bacilli. In his second series the same animals were fed with a similar dose of typhoid culture every other day for two weeks. Cultures made daily from the stools gave no growth of the bacillus of typhoid. In his third series a pig was given a litre of typhoid culture every day for a month, during which time the feces were daily examined. No typhoid bacilli were ever found in the stools, and six examinations of the urine at different times also failed to give a growth of these organisms. The pig was killed, and, although it had been fed only

¹ Maryland Medical Journal, November, 1900, p. 538.

three days before with a typhoid culture, no Eberth bacilli were found in the stomach or intestines, and only a few colonies, which were obtained from the liver. A similar negative result was obtained in his fourth series, in which two rabbits and two guinea-pigs were fed for two weeks with a daily dose of 500 c.c. of typhoid culture, the feces being examined daily. A young dog was fed daily with 1 litre of a twenty-four-hour-old culture of typhoid bacilli. Each day the feces were examined, and although the experiment was continued for a month, no typhoid bacilli were ever found.

Prophylaxis. An interesting question in regard to the prophylaxis of typhoid fever is involved in the question of the duration of life of typhoid bacilli contained in ice. Park¹ experimented with twenty cultures made from twenty-four-hour-old growths of the typhoid bacillus on agar. One loop of each of these cultures was placed in a separate receptacle containing 300 c.c. of filtered water. At the beginning of the experiment the average number of the bacilli per centimetre was 2,500,000; at the end of three days of freezing the average number was 1,080,000. By the end of the week this number had diminished to 361,000; at the end of seven weeks the number was only 2000; by the ninth week the average number of bacilli had been reduced to 127 per c.c., and three of the cultures had become sterile. He concludes from these experiments that it might be said that at the end of nine weeks the ice in a certain proportion of the cultures was sterile, and that live bacilli from all other cultures were greatly reduced in numbers.

The feeling that disinfection of the stools is alone necessary in preventing the spread of typhoid fever cannot be looked upon as having a proper foundation at the present time. It is probably true that, at any rate in the later portion of the attack, the urine contains typhoid bacilli in a sufficient number of cases and in a sufficiently large number to make it imperative that this source of infection should be guarded against. The occurrence of the bacilli in the lung, as was found by Horton-Smith in one case out of nine examinations, should cause us to look upon the sputum of a typhoid fever patient as being capable of carrying infection and of requiring disinfection. That the feces alone are not as much a source of danger as was at one time thought is shown very well by a table given in the *Goulstonian Lectures*, where the examination of stools of seven typhoid fever patients was made at various times. In the seven cases a positive finding is only recorded four times; on the eleventh and seventeenth days two cases in which they were absent both before and after that time, and in another case on the

¹ New York Medical Record, June 9, 1900, p. 1010.

fourteenth day and four days after the temperature had reached the normal point, although a negative result was obtained on other repeated examinations during the attack, during the relapse, and after complete convalescence.

So long as the use of "night-soil" as a fertilizer for vegetable gardens in the neighborhood of large cities is permitted it will be difficult to lessen the typhoid fever rate, no matter how complete the control of the water-supply may be. Theoretically, the eating of vegetables unprepared by cooking would be thought to be a fertile source for infection with the disease. An interesting example of possible infection through the eating of celery occurred in the insane asylum at Northampton, Massachusetts. The statement was positively made by one medical journal that the source of infection had been definitely traced to celery taken from beds fertilized with "night-soil." However, on communicating with Dr. J. A. Houston, the superintendent of the hospital, I learned from him that the source was never definitely determined, but that the theory above mentioned was held because no suspicion could be attached to the milk-supply or water-supply or to other articles of diet used in the raw state.

Serum Diagnosis. Although so much work has been done upon the Widal reaction for typhoid fever, it cannot be said that there is any uniformity in the methods of its application. Aside from the question as to the relative merits of the dry and moist methods of performing the test there is still considerable difference of opinion in regard to the dilution which should be employed in making the test. The sources of error are a too great dilution, which would, of course, cause an absence of agglutinating reaction in cases of typhoid fever, while too slight a dilution would cause a faulty diagnosis to be made where that disease is not present. It would seem from a review of the work that is being done that on the whole the most satisfactory dilution is in the proportion of 1 to 20, the higher dilutions being reserved for testing the relative agglutinating power, and possibly for the strict determination as to the character of dubious examples of the colon and typhoid groups. So also there is still difference of opinion as to the time limit within which agglutination should be supposed to indicate the presence of typhoid fever, and beyond which this infection should be ruled out. The impression gathered from the literature of the past year would indicate that probably an hour should be the extreme length of time allowed for agglutination to occur as a criterion for making the diagnosis of typhoid fever.

The conclusions stated by Horton-Smith in his valuable Goulstonian Lecture in regard to the Widal test are: "For all practical purposes a 1 : 20 dilution with a short time limit (one hour) gives admirable results. A positive reaction so obtained has a diagnostic value about equal to

that of the eruption—that is to say, that in very rare cases both may be observed in cases which are not typhoid fever. If, however, in any given case we require from the test absolute infallibility, then we must use in addition greater dilutions, such as 1:100 (or even higher), employing, of course, the same time limit as before, namely, one hour. But to use such dilutions as a matter of routine would be an error, since we should thereby wilfully diminish the value of the test by excluding many cases of typhoid fever (nearly 20 per cent.) which never reach even the 1:100 limit during any part of their course.”

Course. In the corresponding volume of this work last year mention was made of the occasional occurrence of a sudden onset instead of the gradual development of the phenomena of this disease. An interesting discussion took place upon this occurrence before the Paris Medical Society of the Hospitals.¹ Sevestre stated that it was not rare in children, and relates the case of a girl, aged five years, whose attack began with sudden vomiting and cephalalgia, with sudden rise of temperature. Eight days after this sudden onset spots were found. The girl was known to have been previously perfectly well. A similar case was related by him in a patient, aged twelve years, the attack following being very grave. Widal relates six cases where in the midst of perfect health the attack suddenly began with chill. In the discussion upon these papers Vincent stated that the occurrence was common in Algeria, and that the prognosis in such cases was grave. Others differed with him in regard to the gravity of the outlook.

In the same volume Potain has recorded six cases of typhoid fever consecutive to grippe. The diagnosis of the latter was based upon a chill, with all the symptoms of that infection too marked to be attributed to the prodromal stage of typhoid fever. Immediately following the attack of grippe typical typhoid fever developed, with characteristic tongue and abdomen, enlarged spleen, spots, iliac tenderness, and diarrhoea, with positive Widal reaction. He considers that in these cases the prognosis is not bad, possibly because of the fact that Pfeiffer's bacillus, by lowering the general resistance, allows the appearance of evidence of typhoid infection which would be too slight to ordinarily show any signs. In the discussion upon Potain's paper many cases confirmatory of his observations were given; among these there is one particularly interesting, which was contributed by Menestrier, in which grippe was accompanied by absence of the Widal reaction, then a progressive rise of temperature, with the occurrence of typhoid symptoms and signs, and the development of the Widal and diazo reactions.

The occurrence of typhoid fever without rise of temperature has been

¹ Bull. et Mém. Soc. Méd. des Hôp., June 8, 1900, p. 725.

occasionally noted. It is likely that the frequency with which this condition is noted will increase with the more general use of the Widal test. Etienne,¹ in reporting a case of this kind, has drawn the distinction, which, of course, should be made, between apyretic typhoid fever, ambulatory or latent typhoid fever, abortive typhoid fever, and "mucous fever." In the case concerned, a woman, aged fifty-five years, was taken ill during an epidemic produced by contaminated water. In spite of the presence of intense cephalalgia, malaise, abdominal pain, and diarrhoea there was no elevation of temperature. The development of a characteristic tongue, tenderness in the right iliac fossa, enlargement of the spleen, rose spots, positive diazo-reaction, and the occurrence of agglutination on the twenty-eighth day, with a dilution of 1:25, positively enabled the diagnosis to be made. Diarrhoea diminished on the twenty-first day. Abdominal pain left and the tongue cleaned at the same time. Adynamia disappeared by the thirty-first or thirty-second day. The pulse never rose above 80. As will be seen from the above abstract of the conditions present, the diagnosis could have been made beyond dispute without the presence of Ehrlich's or Widal's reaction. In the discussion upon the paper the necessity for taking the temperature in the rectum is insisted upon—a point that is of considerable importance in recording cases of this character.

Horton-Smith² points out what seems to be a rational explanation of the termination of typhoid fever by lysis rather than by crisis. If we grant that the toxin of the typhoid bacillus is contained practically entirely within the bacillus itself, and is set free, especially, when the bacillus is destroyed, then it is rational to assume that after the bacteriolytic power of the body has reached a certain point the toxin absorption would gradually subside, or, as Horton-Smith puts it, "the effect of the destruction of the bacilli would be a further outflow of poison into the general circulation, and only as this is gradually excreted should we expect the temperature to fall."

Eruption. An interesting point that has lately received a considerable amount of attention is the true significance of the typhoid exanthem. During the past year numbers of observers have been at work upon this interesting question, and many of them have obtained positive results. If further investigations confirm those already made we must conclude that the rose spots are true specific lesions due directly to the presence within the tissues of the typhoid bacillus.

Mark W. Richardson³ gives the results of the examination of the typhoid spots for bacilli in six cases. After cleansing the skin and

¹ Bull. et Mém. Soc. Méd. des Hôp., February 1, 1900, p. 51.

² Goulstonian Lecture.

³ Philadelphia Medical Journal, March 3, 1900, p. 514.

freezing it with ethyl-chloride a small cross incision was made over the rose spot; the latter was curetted with a very fine curette and transferred to a tube of nutrient bouillon. Another tube was inoculated with the blood obtained from the spots as soon as the effect of freezing wore off. In this way typhoid bacilli were cultivated from the rose spots in five out of six cases. The failure was attributed to the fact that only two spots were incised and that no attempt at cultivation was made in the unsuccessful case. In two cases a successful growth was obtained only on a second attempt. Richardson recommends that at least five or six spots should be incised in every case. In an interesting table comparing the rapidity of diagnosis by the Widal test and by cultivation from the spots it is seen that the bacilli were obtained from the spots at variable periods, averaging six days before the Widal reaction was first obtained. As Richardson points out, however, this method of diagnosis is, of course, unavailable in those cases—and they are not few—in which rose spots are persistently absent.

In confirmation of the view that the rose spots are specific lesions produced by the local action of Eberth's bacilli in the skin we have the study of Eugene Fränkel.¹ Fränkel examined the spots by a somewhat original method. He points out that if the organs from a typhoid fever case are removed immediately after death it is difficult or impossible to find the typhoid bacilli, and that ordinarily between the occurrence of death and the performance of autopsy from eighteen to twenty-four hours elapse, giving opportunity for the typhoid bacilli to develop in numbers sufficient to be well seen. Consequently, in investigating the roseola removed by section of the skin during life he placed the pieces so obtained immediately into a reagent glass containing sterile bouillon, and allowed them to there remain for eighteen hours or more at a temperature of 37° C. The bouillon was then removed under running water and the sections fixed in formol. They were then hardened in alcohol, embedded in celloidin, and cut and stained with Unna's polychrome methylene-blue. In the four cases examined he found the bacilli collected in groups, having a somewhat tree-like arrangement, especially in the papillary layers or occasionally in the reticular layers of the skin. The groups of bacilli were found to be present in vessels which were identified as lymphatic paths. In addition to this the sections of the roseola showed that the spot was not due to a simple hyperæmia, but was due to swelling of the papillæ from increase in the fixed connective-tissue cells, and not from exudation of leucocytes. In some cases the epidermis was found to be loosened from the cutis, although the former appeared to be entirely normal. In one

¹ Zeitschrift f. Hygiene und Infectionsk., 1900, Band xxxiv., Heft 3, p. 482.

case coagulation necrosis was seen. Fränkel concludes that the typhoid roseola is caused by stasis of the typhoid bacilli in the lymphatic spaces of the skin, causing local necrobiotic processes in circumscribed areas of the papillary bodies as well as of the overlying epidermis.

During the past year numerous articles have appeared upon the condition of the skin in typhoid fever. Remlinger¹ has written upon varieties of the rash and desquamation observed in the course of typhoid fever. In his article upon rubeoliform and scarlatiniform eruptions he gives an interesting historical summary, with many references as to the condition, and speaks at the same time of the occasional occurrence of typhoid fever with measles or scarlet fever. Twelve personal observations and others collected from the literature enable him to base his remarks upon a total of fifty-nine cases. Almost all were under twenty-five years of age, and he notes the frequency of the occurrence of these eruptions in childhood. It would seem that they are not associated with any particular type of typhoid fever, that they rarely appear early, the usual time being between the twelfth and twenty-first days. A rubeoliform eruption was noted in 31 cases, a scarlatiniform in 4, and a mixture of these two in 14 cases. The eruption is rarely generalized at first, but usually is seen earliest on the front of the chest or near the junction of the extremities with the trunk. As a contrast to the eruptions of measles and scarlet fever it is to be noted that the face sometimes remains completely free, the trunk being the most frequent site, and the anterior surface being more affected than the posterior. The spots have no crescentic arrangement, and may entirely or only partly disappear on pressure, sometimes leaving a central ecchymotic spot like an insect bite. The eruption may terminate in desquamation, and a return of the eruption may be seen. Desquamation may even occur before the disappearance of the rash, and the latter may return on the occurrence of a relapse. As another feature differentiating these eruptions from those of the specific fevers which they resemble, Remlinger calls attention to the fact that the mucous membranes are all spared. There are no subjective sensations, such as itching or burning, which accompany the eruption, thereby differentiating it from some of the lesions of purely local origin. Remlinger considers the prognostic value of the rash as being very doubtful, although those which are scarlatiniform have an unfavorable bearing upon the outlook.

In regard to desquamation in typhoid fever, he relates six cases, in all of which desquamation began at the moment when the temperature started its downward curve. Desquamation was lamellar, not furfuraceous or in sheets, and he classes its characteristics as being midway

¹ *Revue de Méd.*, February, 1900, p. 122, and May, 1900, p. 365.

between those of measles and those of scarlet fever. It was first seen on the lateral parts of the thorax and abdomen, and except in one case was limited to the trunk. In three cases there was an associated alopecia.

The scarlatiniform rash has also been the subject of the Paris Thesis of Paul Angeli.¹ He divides the rash into two groups—early or benign, and late or of grave prognosis. He states that while this character of rash appears epidemically there is no evidence of its having a contagious character. As to the cause of the manifestations, he believes it to be the typhoid toxin, and states that their dependence upon secondary infection is not proven. The view that the scarlatiniform variety of the rash in typhoid fever is not contagious, or, rather, that the peculiar elements of the disease which give rise to this abnormal eruption are not transferable from one to another, is opposed by Aron.²

Weill and Lesieur³ have described at length a type of typhoid fever whose chief characteristics are the profuseness of the eruption, the absence or slight development of digestive troubles, and the favorable termination. They do not consider that the skin lesions are in any way compensatory to the intestinal lesions, but that the cases described simply form a clinical classification. They divide typhoid fever into (*a*) classical typhoid, with rose spots slightly abundant, intestinal symptoms always marked and sometimes extremely intense, with a variable prognosis, but always serious; (*b*) light typhoid fever, with rose spots in small number, the intestinal symptoms lightly developed, and the prognosis good; (*c*) intense typhoid, with abundant rose spots, marked intestinal symptoms, and very grave prognosis; and (*d*) the class particularly studied by them of typhoid fever purely exanthematic, with very abundant rose spots, with absent or very slight intestinal symptoms, and extremely good prognosis. The latter class are subdivided again into (1) benign, as regards duration, temperature-range, and symptomatology; (2) medium, with slight diarrhœa or constipation, more or less obstinate, or with a variable amount of splenic hypertrophy; (3) grave, at least in appearance, from the development of nervous symptoms; and (4) with relapses. From their observations in the average cases of typhoid fever the abundance of the rose spots is some indication in favor of the slight extent of digestive troubles and the favorable character of the prognosis. Even in apparently grave forms the development of the exanthem seems to augur well. Their observations are based upon 280 cases of infantile typhoid seen in the course of six years. That the favorable outcome in the class of cases particularly described by them is not due to the well-known ease with which children withstand typhoid

¹ Abstract in *Gaz. hebd. de Méd.*, May 6, 1900, p. 426.

² Paris Thesis, Abstract in *Gaz. hebd. de Méd.*, August 26, 1900, p. 816.

³ *Revue Mens. des Mal. de l'Enf.*, May and June, 1900.

fever is shown by the fact that in the 280 cases observed by them, whose ages varied from two to fifteen years, 16 died, 28 were grave, and 27 were of medium gravity, while 124 were either benign or mild. Among the series of 280 cases rose spots appeared on an average on the eighth to the tenth day, and lasted five or six days, to reappear once or twice, eight or ten being visible at a time. In the class that forms the subject of their paper, on the other hand, the rose spots often appeared from the fourth to the seventh day. The individual lesions were sometimes large and were sometimes ecchymotic or papular. The spots were always abundant and widely scattered, being seen on the abdomen, in the epigastrium, on the thorax, neck, flanks, back, arms, and thighs, often on the forearm and leg, and sometimes on the face and hands. As a rule, the digestive functions were not at all disturbed, while the abdomen was flat, the spleen normal or slightly enlarged, and the tongue did not show the typhoid characteristics. If diarrhoea was present it was slight or transient, while constipation was more frequent, although never obstinate. Even in these cases with a favorable outlook the temperature might be very high, with delirium, exaggeration of the knee-jerks, and ankle clonus. The two characteristic associated signs were abnormal development of the exanthem, with absence of intestinal symptoms. In this class recovery usually occurred on the fifteenth or twentieth day, while the fever frequently yielded to cold baths in eight or ten days. Rarely was the temperature elevated for more than three weeks. Among their 280 cases 73 had a remarkably intense eruption, and in only 15 of this number were digestive troubles noted. On the other hand, they also found that among 73 of their cases without notable digestive trouble only 15 had an eruption that was insignificant. Among the 73 cases with abundant eruption no deaths occurred. Among the 280 cases they had 58 examples (20.70 per cent.) with profuse eruption and without intestinal symptoms. The analysis of these 58 cases showed that 22 were benign, 15 were of medium severity, 12 were accompanied with grave symptoms, and 9 had relapses. The 22 benign cases showed involvement of the nervous system in 3, albuminuria in 6. The 15 cases of medium severity showed nervous manifestations in 4, albuminuria in 7; the 12 grave cases showed nervous symptoms in 8, and the same number had albuminuria. In the nine cases with relapse 4 cases had involvement of the nervous system, and the same number had albuminuria. They again, in concluding, draw attention to the fact that the profuse eruption is only of prognostic value where the intestinal symptoms are absent. This same variety of typhoid fever is the subject of a Lyons thesis by Boulin.¹

¹ Abstract in *Gaz. hebdomadaire de Médecine*, July 1, 1900, p. 619.

The Condition of the Blood. Horton-Smith¹ showed that in twelve cases of fatal typhoid fever coming to post-mortem examination the blood in 5 was sterile ; in 2 it contained typhoid bacilli, in 1 streptococci and staphylococci, in 2 the bacillus coli, and in 2 the bacillus coli with proteus. One of the two cases in which the typhoid bacilli were found in the blood was a girl dying on the fourteenth day, apparently from intense intoxication with the poison. Out of thirty cases, including his own, the typhoid bacilli were only found in nine.

Complications. An interesting account of a rare complication is that of Stahl,² describing ten cases of gangrene of the skin occurring among 144 examples of typhoid fever. While occasionally small spots of superficial gangrene involving the skin are seen in grave cases of typhoid infection, such wide-spread lesions as in the cases recorded by Stahl must be extremely rare. It is possible that the cause of this large number of instances of this rare complication among Stahl's cases may be due to the fact that they occurred among soldiers returned from various camps wherein the hygienic conditions were not of the very best.

Glossitis, which must be considered as one of the more unusual of the complications of typhoid fever, was present in a case reported by H. Campbell Thomson.³ The patient a few hours before death had sudden swelling, confined to the left half, of the tongue. The tongue had been normal in appearance at noon, while by seven o'clock in the evening it was swollen to such an extent as to give rise to some difficulty in swallowing. It was firm and without fluctuation, and was tender to the touch. Three hours later the right half of the tongue was found to be involved, and puncture with a grooved needle was performed with very little result. At autopsy no suppuration was found in any portion of the organ. A case reported by McCrae, it will be remembered, was referred to in *PROGRESSIVE MEDICINE* in the number for March, 1900. In McCrae's case, as in one occurring several years ago under my own care, prompt relief followed the making of punctures in the tongue, swelling rapidly subsiding upon the occurrence of quite free hemorrhage.

PERITONEAL COMPLICATIONS. The difficulty of making a definite diagnosis of perforation in the course of typhoid fever has been decidedly lessened by a knowledge of the fact that upon the occurrence of perforation, or, rather, before the occurrence of actual perforation, there is a rise in the number of leucocytes per cubic millimetre. To determine the value of such a leucocytosis it is, of course, important that the leuco-

¹ Goulstonian Lecture

² American Journal of the Medical Sciences, March, 1900.

³ Lancet, June 23, 1900.

cytes should have been previously counted in order to determine the normal leucocyte ratio of the individual patient. In addition to this, secondary infection by the pyogenic cocci is frequently present in these cases, and the influence of this in causing a rise in the number of the leucocytes must be borne in mind before determining the exact degree of importance to be attributed to a leucocytosis replacing the leucopenia ordinarily seen in typhoid fever. Frequently it happens that a case is brought into the hospital late in the course of the fever, with symptoms and signs pointing to the occurrence of perforation. In such cases, of course, there has been no opportunity for a previous estimation of the leucocytes, and, unless we can absolutely exclude secondary infection, an absolute increase in the leucocytes would aid us but little. The serious results of anæsthesia in cases so ill as are those in the late stages of typhoid fever make us hesitate to advocate abdominal exploration unless we have quite definite and distinct signs indicating perforation. It is partly on this account that operation in cases of suspected perforation is postponed until there is no hope of relief even by opening the abdomen and closing the orifices. In the number of the *Philadelphia Medical Journal* for March 3, 1900, there is an interesting article by Cushing upon exploratory laparotomy under local anæsthesia for acute abdominal symptoms occurring in the course of typhoid fever. His first case is briefly referred to, having been previously reported, and does not quite come under the limit of his article, inasmuch as a few whiffs of chloroform were given. Four other patients had the abdomen opened after local anæsthesia had been produced by Schleich's infiltration method in the line of the proposed incision. These were cases of suspected perforation. In one the abdominal symptoms were caused by an iliac thrombosis; in another the symptoms were produced by a diseased appendix, which was removed; in a third exploration disclosed a minute perforation; in the fourth exploratory section was made upon a case where the abdominal symptoms proved afterward to have been produced by diaphragmatic pleurisy and pneumonia. His operations were performed painlessly, and in each case satisfactory evidence was obtained as to the cause of the symptoms presented or as to the absence of evidence of perforation.

In a case recently under my care, admitted to the Pennsylvania Hospital three days after perforation had occurred, exploratory laparotomy performed by Dr. Le Conte with local anæsthesia was accomplished painlessly, readily, and without any apparent bad effect upon the patient, who was in such a desperately ill condition that all idea of general anæsthesia was out of the question. While this patient died, in spite of the relief afforded by drainage through the wound, it was given a chance to recover from the results of perforation, which it could not have had offered to it had general anæsthesia been the only

means at our command to render the operation possible. So far as could be judged, with the patient in such a bad condition, the injection of the local anæsthetic, the incision of the abdominal wall, the evacuation of the fetid sero-pus mixed with feces, the insertion of the drainage-tube, and the suturing had absolutely no effect upon the patient's condition. While no marked improvement was seen after drainage of the abdominal cavity, there was no evidence at all that the downward course, that was steadily pursued during the few hours necessary to obtain the parents' consent to the operation, was hastened in the slightest degree. During the operation the child was totally unconscious of any surgical interference, and talked to the nurse about a promised glass of soda water without the slightest evidence of pain or fright or of shock. While the result in this case was not satisfactory so far as regards the patient's recovery, local anæsthesia enabled us to make an effort to relieve the condition of affairs that certainly unrelieved would kill the child in a short time. The method deserves a further trial, and from our experience in this case, and from the results reported by Cushing, it would seem that while needless laparotomy is to be deprecated in this as in any other condition, it is possible to enter the abdominal cavity without evident serious harm to a patient suffering from typhoid fever. The same cannot be said of the use of a general anæsthetic in this condition.

A valuable report upon peritoneal infection occurring in the course of this disease is given by Shattuck, Warren, and Cobb,¹ acting as a committee of the Boston Society for Medical Improvement. The report covers a study of twenty-four cases of typhoid fever with symptoms of peritoneal infection. Seventeen of the cases were instances of perforation; two cases presenting the symptoms of perforation were instances of general infection from threatened perforation, with areas of necrotic peritoneum; one was a case of general infection from rupture of a mesenteric gland; one was a case of general infection from unknown cause, but supposed to be due to intestinal perforation, while three cases had no cause ascertained for the symptoms suggesting operative interference. The authors stated that they have been unable to find more than four cases of operation for perforation in children under the age of twelve years reported in the literature. The little girl admitted to the hospital with a typhoid perforation of three days' standing, which was mentioned above, was aged only seven years. A curious fact noted in the paper in question is that out of the twenty-four cases eighteen presented a mild course. Curiously enough, the text-books still continue to describe the symptoms of perforation as though a sudden, marked

¹ Boston Medical and Surgical Journal, June 28, 1900, p. 677.

change in the picture took place, with severe abdominal pain, general collapse, and abdominal rigidity. This certainly is not the course of patients seen at the bedside, and the study of this series shows that in only seven out of the twenty-one was there a severe and sudden onset of symptoms due to perforation, and from their series the authors conclude that the severe symptoms described in the text-books are due not to the occurrence of perforation, but to the onset of septic peritonitis resulting from the accident.

In these seven cases presenting symptoms indicative of perforation only five proved to be due to this accident, while in one case there was no perforation, and in the remaining case the symptoms were not due to the accident. In the other 14 cases of their series of 21 distinct warning symptoms were present; in 6 complaint of general abdominal pain was made; in 4 abdominal distention was present throughout the course of the fever; in 3 pain was localized in the left iliac region, in 4 in the right iliac region, in 1 in the lower abdomen, in 1 general abdominal pain with pain in the rectum and bladder, while in 1 case the pain began in the epigastrium and later became localized in the right iliac region. The time in which the warning pain occurred varied from three to five hours up to sixty hours before the occurrence of perforation. Three cases showed vomiting. In 3 of their cases the temperature rose, in 6 it did not fall, in 3 it was slightly lowered, in 1 it fell and remained subnormal, and in 2 it temporarily fell to normal. In only one of their cases was the area of liver dulness obliterated. This absence of obliteration of liver dulness cannot be too much insisted upon. In many cases with tympany, where perforation is certainly not present, the area of dulness in the right hypochondrium is either extremely diminished or is absent, while in many of the cases with perforation shown to be present, either by operation or at autopsy, there has been a normal area of hepatic dulness throughout the whole course of the case. In the little patient that I have spoken of above, who was lately under my care, the area of hepatic dulness extended from the upper border of the sixth rib to the costal margin, although the peritoneal cavity was distended with gas.

At the present time much interest attaches to the value of relative increase of the leucocytes as a sign of perforation. Among the twenty-one cases in which perforation and peritonitis were found in this series of cases a leucocyte count was made in eleven. So far as the results of their examination go in these cases they bear out what has been frequently insisted upon—the rapid relative increase in the number of leucocytes at the time of perforation.

The conclusions that the authors arrive at as the result of a study of this series of cases are :

1. In many very sick typhoids perforation or peritoneal infection cannot be diagnosed until the results are already wide-spread and of fatal extent. The chances of a fatal issue from an abdominal operation in such cases are overwhelming.

2. In mild typhoids of fair general condition an abdominal operation is readily borne, provided no peritoneal infection is present.

3. A small number of mild typhoids may have sudden perforation with free extravasation. In these the symptoms are fulminant, but localized to a great extent, and in these

4. Operation must be done at once, for general infection may become past relief in from one to five hours, and walling off of the perforation by protecting adhesions is so rare as not to be counted upon.

5. In the majority of mild cases beginning infection (whether from perforation or not) is marked by comparatively slight symptoms—local pain, tenderness, spasm, and leucocytosis. The severe following symptoms mean general peritonitis.

6. These warning symptoms demand serious consideration and study, but in many cases are either not rightly understood or not acted upon.

7. Complaint of abdominal pain in a case of typhoid should always lead to a suspicion of beginning peritoneal infection.

8. Frequent leucocyte counts are needed in every case of typhoid. In the presence of abdominal pain an hourly count is necessary.

9. Pain associated with local tenderness and muscular spasm and a rising white blood count points in most cases to an operation; in all cases to a surgical consultation.

10. In not a few of this series of cases operation was imperative a varying number of hours before it was done.

McPhedran¹ also speaks of the occasional absence of all symptoms pathognomonic of rupture in cases of typhoid fever, and mentions a mild case in which none of the symptoms originally attributed to perforation were present. A second case is also related where sharp pain occurred in the right hypogastric region toward the end of the third week in an attack of typhoid fever. In this case, also, characteristic symptoms were absent, but operation revealed pelvic peritonitis due to a perforation in the ileum. The author quoted agrees with Shattuck, Warren, and Cobb in viewing abdominal pain as the most constant and characteristic symptom of perforation.

NERVOUS COMPLICATIONS. In typhoid fever the symptoms and signs on the part of the nervous system form such an important feature that the definite determination of the cause of such symptoms and signs must be extremely valuable. Alexander G. R. Foulerton and H. Camp-

¹ Philadelphia Medical Journal, March 3, 1900, p. 525.

bell Thomson¹ have contributed an interesting article upon the "Causation of Nervous Symptoms in Typhoid Fever." Two cases of marked cerebral irritation which came to autopsy were examined bacteriologically. The first patient had marked cerebral symptoms, but none that pointed definitely to meningeal inflammation. At autopsy the brain and its membranes were found to be normal, and cultures which were taken from the surface of the brain and from the cavity of the lateral ventricles showed no growth.

In the second case there were convulsive twitchings and intermitting retraction of the head, with facial paralysis and slight oscillatory movements of the eyes, together with *tache cérébrale*. At autopsy in this second case there was found injection of the pia mater, with an excess of turbid and reddish-brown fluid in the lateral ventricles. In the latter the bacillus typhosus as well as the bacillus coli communis was present. Sections were made from the cerebral cortex of both of these cases, and of a third case dying of typhoid fever without cerebral symptoms. In the first case mentioned above the ganglion cells of the cerebral cortex showed no pathological change; in the second case—the one with more marked evidence of meningitis and with the gross lesions present in the pia after death—the outline of some of the cell bodies was rather indistinct and some of the cells were considerably swollen. In a few of the cells the Nissl bodies had disappeared, leaving small unstained areas. The nuclei and nucleoli were unchanged. In the third case—without any cerebral symptoms—the cell bodies, nuclei, and nucleoli were perfectly normal. The authors look upon the changes found in the ganglion cells in their second case as being due to the meningitis that was found at autopsy rather than as an effect of the typhoid toxin. Experimental typhoid intoxication by inoculating living and dead cultures of typhoid bacilli into the peritoneal cavities or subcutaneous tissue of rabbits and guinea-pigs gave almost negative results. In only a few cells of the cerebral cortex were there any changes whatever, and in these the lesions were not marked. As the authors have stated, however, their negative result does not at all prove that the nervous manifestations of typhoid fever are not due to the toxin; they simply show that the toxin does not produce histological changes in the ganglion cells.

Ganiox² has made generalized paralysis in typhoid fever the subject of an extremely interesting paper. He divides these into three types: (1) Subacute descending poliomyelitis, (2) polyneuritis, and (3) the mixed type. Under the first type he refers to five cases seen by himself and to the observations of others. It appears that this form may show itself during convalescence from the third to the seventh day of apy-

¹ Lancet, April 21, 1900.

² Gaz. hebd. de Méd. et de Chir., 1899, No. 43.

rexia, the onset being abrupt and without prodromes, the first phenomena being usually seen in one extremity, usually the legs, and from there ascending in quite constant order, involving the muscles first of the toes and foot, then of the thigh and pelvis, then of the hand and arm, the trunk, the muscles of respiration, the tongue, the pharynx, and œsophagus. While it may be so wide-spread the paralysis is most complete at the extremities. The sphincters may or may not be involved. There are neither sensory troubles nor muscular atrophy. Usually the reflexes are abolished. Toward the end bulbar symptoms appear. Paralysis may be complete on the fourth or the seventh day, or even as soon as at the end of the first twenty-four hours. Intelligence is preserved throughout. While he states that the termination is always by death at the end of twenty-four hours to seven days, he mentions two cases reported by Raymond as having been followed by cure. The second (polyneuritis) he says is the most frequent and the least grave. Unlike the first type, the onset is insidious, and sensory symptoms frequently precede those connected with motion, taking the form of paræsthesia or active pain. Later, sensation is usually diminished or abolished, while pressure over the nerves or muscles is usually painful. Ordinarily loss of power is not complete, and the reflexes, while diminished or absent, may sometimes be increased. Reaction of degeneration may be present, but it is apparently not so frequent in this as it is in other forms of polyneuritis. In addition to mentioning other cases from the literature he speaks of one of his own, beginning on the fifteenth day and resulting in cure.

In the third type, as would be expected, the symptoms presented are a mixture of the first two types. In the cases observed by Ganioz there was at first paralysis of the toes, which extended in three days so that the arms, trunk, and nucha were affected, while phonation, deglutition, and respiration were altered. The reflexes were abolished, and there was retention of feces and urine. Sensation was not impaired. Ten days later atrophy, with extreme hyperæsthesia of the muscles, was present; one month later there was return of movement in the hand, forearm, and toes, but otherwise the palsy remained. He considers that all of these general paralyses are due to the action of toxins upon the nerve elements.

Three cases of convulsions occurring in the course of typhoid fever are reported by Thomas Ash Claytor.¹ All three of the patients were soldiers. In the first case there was a considerable amount of delirium present. On the thirty-fourth day of his illness he suddenly during sleep uttered a sharp cry and went into a convulsion, accompanied by

¹ Philadelphia Medical Journal, March 3, 1900, p. 528.

unconsciousness and frothing at the mouth. On the fiftieth day of the disease a second convulsive attack occurred and was followed by rigidity. Consciousness was not regained for forty-six hours, but after its return complete recovery rapidly took place. The second patient had his first convulsion, with unconsciousness, on the twenty-seventh day of his illness, but recovered without further attacks. In the third patient the first convulsive attack occurred on the thirty-fourth day of the disease, when, after a period of delirium, there occurred jerking of the limbs, with retraction of the head, lasting for ten minutes. Within the next twenty-four hours two other attacks of convulsive movements occurred. Nothing in the physical examination threw any light on the cause of the attacks, and the subsequent course of the case was uneventful. Claytor attributes the attacks, and probably correctly, to intense action of the toxins upon nerve centres already exhausted by experiences during a severe campaign.

The occurrence of epileptic attacks during recovery from typhoid fever is noted by F. Mühling¹ in a case wherein after a typical attack of the infection a sudden epileptiform seizure occurred on the twentieth day after the temperature had fallen. The clonic spasms began in the last two fingers of the left hand, and then affected the left eyelid and finally the whole body. The convulsion continued for a half-hour. Three hours later a similar attack occurred and continued for twenty minutes. On the evening of the same day a series of attacks lasting an hour, with intervals of from one to five minutes, occurred. In the intervals between the attacks the patient seemed in his usual condition. No later convulsive attacks occurred, but during the day on which they were noted and for ten days thereafter a feeling of crawling and formication were noted in the last two fingers of the left hand. The heart was normal, there was no albumin or sugar in the urine, or other apparent cause for the attacks save the result of the typhoid infection. Except for these convulsions convalescence was otherwise uneventful, and at the end of a year the patient was well and had had no further trouble.

A curious nervous disturbance occurring in a convalescent from typhoid fever is recorded by Jacquet and Lacasse.² Following a slight intestinal hemorrhage the patient had a sudden, severe pain in the left popliteal space. On examination there was found hyperæsthesia of the abdomen, chest, and left side of the face as well as of the left leg. There was also dilatation of the left pupil, and both vision and hearing were apparently more acute upon the left than upon the right side. It was thought also that the senses of smell and taste were more acute upon

¹ Munch. med. Wochenschr., February 13, 1900.

² Bull. et Mém. Soc. Méd. des Hôp., May 4, 1900, p. 519.

the left than upon the right side. The left testicle was more tender than the right. On the night following this occurrence paresis of the bladder came on and lasted until the next day. Further in the course of the case there was sudden loss of consciousness, with a general convulsion lasting for five minutes; late atrophy of the left leg was noticed. The history of the nervous phenomena seems strongly suggestive of hysteria, although the authors consider that that cause for the manifestations can be ruled out.

Meningitis produced by the typhoid bacillus has been reported by Hugo, Fernet, Lacapere, and Troisier. Hugo, after a review of the literature, stated that in the eight cases that he has found recorded six were proved by bacteriological examination to be true instances; one was cured, and in one the bacteriological examination was not recorded. He reports one case coming under his observation in which on the eighth day of the disease there was loss of consciousness, with prolonged retraction of the head, tremor, and carphologia. Examination of the eye-ground was unsatisfactory, but showed nothing definite. Widal's reaction was positive. On the thirteenth day of the disease sudden death occurred, and there were found the intestinal lesions and enlargement of the mesenteric glands with, in addition, opaque cerebro-spinal fluid and purulent leptomeningitis without tuberculosis. Eberth's bacilli were found in almost pure culture in the cerebro-spinal fluid examined directly and in fluid from the ventricles obtained by puncture with a trocar. Fernet and Lacapere,¹ writing a little later, state that fifteen cases have been found in the literature, and add another typical case of typhoid fever, with positive Widal reaction, which on the fifteenth day was seized with violent headache, delirium, and stiff neck. On the next day strabismus was noted, but Kernig's sign was found absent. Death occurred on the seventeenth day of the disease. At autopsy there were found typhoid lesions in the intestines, abnormal vascularity of the meninges, with opaque serosity about the blood-vessels, and marked œdema of the cerebral substance, with effusion at the base. Cultures from the latter showed typhoid bacilli. Troisier² has reported a case of typhoid fever with intense cephalalgia throughout the attack, but without delirium. The temperature began to fall by the twenty-first day, but three days later, although the temperature was normal, more violent headache and photophobia appeared, with painful contraction of the nucha, retraction of the head, and vomiting. *Tache cérébrale* was marked, but Kernig's sign was absent. For four days the patient remained free from fever; then torpor, with slight noc-

¹ Bull. et Mém. Soc. Méd. des Hôp., April 27, 1900, p. 512.

² Ibid., May 4, 1900, p. 533.

tural delirium, appeared and continued for fourteen days, leaving behind no remains of meningitis. Hysteria was not present, nor was there any ear disease to act as a possible etiological factor. He thinks it hardly possible that this was a meningismus. Unfortunately, lumbar puncture seems not to have been performed. In the discussion upon Troisier's paper Vincent states that in 1000 cases he saw meningitis occurring twice as a complication, one of the patients recovering, the other dying and showing at autopsy meningitis due not to the typhoid bacillus, but to pneumococci. Other cases were reported briefly in the discussion.

Another case of purulent meningitis has been reported by Shorno,¹ wherein the meningeal symptoms appeared on the twentieth day. Death occurred on the twenty-third day, and typhoid bacilli were found at autopsy in the meningeal pus.

Meningismus in typhoid fever is the subject of the Paris Thesis of Henry Laval.² The original has not been obtainable by the writer, but should be consulted by those particularly interested in the meningeal complications of typhoid fever.

A curious event in the convalescence from typhoid fever occurred in a case reported by Annequin.³ A patient, three days after defervescence, without headache, vertigo, convulsions, or trouble with his intellect, was found one morning to have paresis of the left side of the face, the left arm, and the left leg. This muscular weakness increased for the next five days, and then gradually diminished, leaving only atrophy of the muscles of the left hand. No cerebral symptoms accompanied the paresis except that for a few days there was slight difficulty in articulation without sensory aphasia. Several months later examination showed that there was complete homonymous hemiplegia of the right side. The inferior portion of the face was involved, the face being drawn to the left, and the tongue protruded to the right. The right arm and leg were palsied and flaccid without tremor, athetosis, or other abnormal movement. Muscular atrophy was distinct, but the tendon-jerks were exaggerated and reaction of degeneration was obtained in the muscles of the hand and forearm. He concludes that his case was an instance of a combination of hemiplegia involving the right side of the brain with neuritis of the hand and forearm of the right side.

An example of an interesting and rare complication of typhoid fever is put on record by Arthur Schiff⁴ in a nineteen-year-old patient, who

¹ *Dejetskaja Medizina*, 1899, No. 13; Abstract in *New York Medical Journal*, February 3, 1900, p. 172.

² Abstract in *Gaz. hebd. de Méd.*, June 24, 1900, p. 595.

³ *Lyon Médicale*, March 4, 1900.

⁴ *Deutsches Archiv. f. klin. Med.*, Band lxxvii., Heft 1, p. 175.

was admitted at the end of his first week of an attack of typhoid fever; the sudden appearance of serious symptoms on the part of the nervous system was noted on the ninth day of the disease. During an otherwise uneventful course there appeared a sensation of great weakness in the whole of the body, with inability to move any of the members. On examination there was found to be absolute motor palsy, with flaccidity and absence of reflexes in both lower extremities, while both upper extremities were the seat of a flaccid paralysis, which was almost complete. There was no affection of the nerves. Together with the motor palsy, there was absolute anæsthesia of all four extremities and of the abdomen, extending up to the third costal cartilage in front and the second spinous process behind. Above this sharp line of demarcation sensation was normal. On the morning preceding the appearance of these symptoms there was incontinence of feces, which might be an indication that the paralysis had not affected all four members at one time. Curious respiratory phenomena were noticed, due to the preservation of the function of the diaphragm, while the abdominal and thoracic muscles were paralyzed. Five hours before death, which occurred eighteen hours after the onset of the palsy, lumbar puncture was made, and by it were obtained 20 c.c. of clear, sterile cerebrospinal fluid. At the autopsy there were noticed swelling and redness of the spinal cord at the level of the fourth, fifth, and sixth cervical nerves. Cultures from the spinal cord at this point showed no growth. In the upper cervical cord there was a very small number of minute hemorrhages, but no other alteration. In the lower portion of the fourth cervical segment there was marked change found in the ganglion cells and the axis-cylinders of the white matter of the cord. Slightly lower down in the fourth cervical segment the vessels were widened and there was considerable extravasation of blood in their neighborhood. The process was most intense at the level of the fifth cervical segment, where the alterations reached so high a point that the appearance of the cord was hardly recognizable. Similar changes were found to a greater or less extent from the fifth to the eighth cervical segment. From that point to the fifth dorsal segment nothing unusual was found. At the level of the fifth dorsal there was again blood extravasation, which extended downward to the eighth dorsal, exclusively in the gray substance. No typhoid bacilli or other organisms were found in any of the sections. The case would, therefore, come under the category of typhoid fever, complicated by acute, transverse hemorrhagic myelitis, due to the action of toxins produced by the specific cause of the disease.

Netter,¹ in the Section on Pathology at the Thirteenth International

¹ Abstract in *Gaz. hebd. de Méd. et Chir.*, September 13, 1900, p. 866.

Congress of Medicine, has drawn attention to the existence of the meningeal symptoms in typhoid fever, due either to a true typhoidal meningitis or to a pseudomeningitis. The presence of Kernig's sign is a valuable means of deciding the prognosis, as would appear from his observation that in 44 cases where this sign was observed 9 patients died and 8 relapses occurred, while among 969 cases where Kernig's sign was absent there were only 19 deaths and 43 relapses; or, in other words, the deaths among those patients showing Kernig's sign were thrice as many as among those where this sign was not present.

In connection with the various affections of the nervous system which have been referred to mention should be made of an interesting experiment by Vincent,¹ who found that upon injecting some drops of a very active typhoid toxin into the neighborhood of the sciatic nerve of a guinea-pig symptoms and lesions of typhoidal peripheral neuritis were produced. In a small dose no abnormal symptoms followed. After the injection of a large quantity there followed on the next day a little pain and local swelling; then followed rapid atrophy, with distortion of the toes, loss of sensibility, and coldness of the feet. The motor, sensory, and trophic disturbances began toward the end of the sixth day. Histological examination of the nerves showed marked changes in the myelin, with segmentation, especially of the median and small nerves. After a longer time there was found much degeneration of the nerve with fragmentation of the myelin and varicosity of the axis-cylinders. The muscle fibres supplied by the nerve lost their striation, and their protoplasm became granular and took stains poorly. In some cases the fibres were transformed into homogeneous masses. The nuclei of the sarcolemma were preserved, and some of them had undergone multiplication.

Three cases of abducens paralysis occurring in the third week of typhoid fever are reported by L. Braun.² In two of the cases the paralysis was unilateral, and in both occurred in the right eye. In a third case, which ended fatally, the complication was bilateral, and at autopsy there was found softening of the nuclei of both abducens nerves. In the same paper he reports a case of optic neuritis occurring in the course of typhoid fever, in which also there was stiffness of the neck, facial palsy, and ptosis, due, he believes, to affection of the meninges. A case of optic neuritis has also been reported in typhoid fever by König.³

LARYNX. In an article upon the typhoid affections of the larynx

¹ Abstract in *Gaz. hebdomadaire de Méd. et Chir.*, March 8, 1900, p. 219.

² *Wien. med. Presse*, 1900, No. 16; Abstract in *Lit.-Beilage Deutsches med. Wochenschr.*, April 26, 1900.

³ *Le Progrès Médical*, 1900, No. 5.

R. W. Marsden¹ reports four cases of this condition. His first patient had no laryngeal manifestations until the sixth week, when barking cough and laryngeal stridor appeared. A few days later laryngeal examination was made, when there was found a rounded, inflammatory swelling on the right side, including the right cord. A high tracheotomy was necessary because of cyanosis. Fixation of the right cord and of the right arytenoid was felt, which was apparently slightly enlarged by the use of dilators, but which did not permit of the removal of the tracheotomy tube. The second case showed hoarseness on his admission at the end of the third week. Ulceration of the fauces occurred at the end of the fourth week, and although the throat had improved during the seventh week, complete aphonia was present. A relapse occurred at the end of the eighth week, and shortly afterward marked stridor was noted, with impairment of aëration. This became so marked that during the tenth week tracheotomy was performed. The further outcome was the same as in the first case—that is, the right vocal cord and arytenoid cartilage were left immovable. A third case was admitted the middle of the third week; at the end of the fourth week there was hoarseness, with other evidence of laryngeal obstruction. A laryngeal examination was first proposed at the end of the sixth week, when there was found much inflammatory œdema about the cords and arytenoids. The condition passed off in this case without the necessity for operative interference arising. In his fourth case laryngeal symptoms occurred in the second week of a relapse, which increased to such an extent that tracheotomy had to be performed. In this patient there was undoubted diphtheria in addition to the typhoid infection, so that it does not properly belong among the cases of laryngeal complications of typhoid.

The same subject is treated by Lockard.² He states that the adenoid tissues in the larynx are attacked in the same way as are similar tissues in the intestine, and that when the laryngeal manifestations are due to involvement of this tissue the typhoid bacillus is alone responsible for the lesion. A case is reported in which there was some complaint of sore throat on the eighth day of the disease, but at this time no examination was made, and the discomfort soon disappeared. However, in the sixth week there was a return of pain, with dyspnœa, and on examination there was found a serious involvement of the left arytenoid, with suppuration. Tracheotomy was performed and was followed by endolaryngeal incision and the evacuation of much pus. After recovery the left vocal cord was found fixed in adduction from ankylosis

¹ Manchester Medical Chronicle, January, 1900, p. 252.

² New York Medical Journal, June 30, 1900, p. 1039,

of the crico-arytenoid articulation, while the right cord was abducted from perichondritis. Intubation failed to relieve the condition, and the cords were gradually removed by the curette to a degree sufficient to allow of breathing. Voice was destroyed except for a faint whisper.

A similar case was reported by Lambert,¹ wherein toward the end of the third week laryngitis appeared, with redness of the fauces and a grayish deposit in the pharynx. In three days complete aphonia was present, and tracheotomy was necessitated by an attack of suffocation. Sudden death occurred from heart-failure, and at autopsy there was found a thick membrane extending from the epiglottis into the larynx, with an abscess cavity in the sulcus on one side. On section of the tissues both diplococcus and streptococcus were found.

Horton-Smith looks upon laryngeal ulceration occurring in the course of typhoid fever as being a complication due to secondary infection with the pyogenic micro-organism, and not as a specific typhoidal lesion.

An excellent article upon perichondritis of the larynx in typhoid fever by Fussell appears in the *Transactions of the Association of American Physicians*, 1900, p. 173. After reviewing the literature of the subject he reports two cases which occurred in his own practice, one of which had been previously reported. His recent case showed laryngeal symptoms thirteen days after the beginning of convalescence, stridor being noticed when the patient was excited. By the next day stridulous breathing was present even during sleep. Tracheotomy was performed on the evening of this day and a tube was inserted. It was removed at the end of six months. Fussell points out that in both cases (and the same is true of cases mentioned above) the complication occurred during convalescence, and in both it followed either exertion or trauma, the severe symptoms coming on suddenly and rapidly increasing.

A case of typhoid involvement of the larynx has been reported by Vincent,² death occurring from oedema of the glottis. In this case the larynx was examined histologically. In the sections many micrococci were found, especially below the ulcers in the mucosa. No typhoid bacilli were discovered. The micro-organisms reached the perichondrium. Culture showed that the main organism present was a streptococcus, but that there were a few colonies of staphylococcus albus. This observation of Vincent, therefore, goes to prove the truth of the statements made by others, that the laryngeal lesions in typhoid fever are due not to the specific action of the bacillus of Eberth, but to secondary infection with other micro-organisms.

¹ New York Medical Journal, February 14, 1900, p. 654.

² Thirteenth International Congress of Medicine: Abstract in Gaz. hebdomadaire de Med. et de Chir., September 13, 1900, p. 868.

Stenosis of the larynx following typhoid fever, necessitating operation, was reported as occurring in one case by Niehnes.¹

GENITO-URINARY SYSTEM. An interesting case of nephritis complicating typhoid fever is reported by Horton-Smith in the *Goulstonian Lectures*. The patient was taken ill eleven days before his admission, with pain and difficulty in micturition. When admitted to the hospital he was found to be suffering from typhoid fever, with spots, and a positive Widal reaction, and also with nephritis. The urine was found to contain blood, a good deal of pus, very many casts, and one-tenth of albumin (presumably by bulk on boiling). On the thirteenth day of the disease bacteriological examination showed that the urine contained a pure culture of the typhoid bacillus. Throughout his illness the nephritis continued with bacilluria. The temperature reached normal on the thirty-fourth day, and on the day following the urine, under the administration of urotropin, was free from bacilli. In a few days the casts and albumin also began to disappear. This is probably as striking an instance of the occurrence of nephrotyphoid as has ever been recorded.

Another instance of this unusual complication has been reported by H. Reynolds Brown.² The patient came under observation about two weeks after the onset of his illness, and when first seen passed scanty urine containing blood, numerous tube casts, and over 20 grammes of albumin per litre. By the sixteenth day after the onset of the disease typical spots were found. The temperature continued elevated, delirium appeared, and the patient died in coma, but without convulsions, on about the twenty-first day of his illness. No statement is made in the report as to the presence or absence of the Widal reaction or as to a bacteriological examination of the urine having been made.

In a second communication regarding the presence of typhoid bacilli in the urine Gwyn³ contributes further facts in regard to this subject. He concludes that from 20 to 30 per cent. of cases of typhoid fever have typhoid bacilli in the urine at some time in their course. His experience comprises ten cases of typhoid bacilluria, in which pure cultures of the organism were found in numbers varying from 10,000,000 to 500,000,000 per cubic centimetre. He, with other authors, notices the rapid diminution in the number of the bacilli following the use of urotropin. In five of his cases pyuria was a marked feature; in three of his cases bacilli were obtained from the urine and identified before the appearance of the Widal reaction. As he points out, however, the diagnostic value of bacilluria is limited from the fact that it is present

¹ Abstract in *Vereins-Beilage Deutsches med. Wochenschr.*, October 11, 1900, p. 243.

² *British Medical Journal*, January 27, 1900, p. 195.

³ *Philadelphia Medical Journal*, March 3, 1900, p. 526.

in only about 20 to 30 per cent. of cases. He calls attention to the necessity for disinfecting the urine as a prophylactic measure, and states that equal parts of carbolic acid (1:40) will kill all the bacilli in all urines, while mercuric chloride (1:50) when added to the urine in equal proportions will render it sterile in from one to two hours.

A series of ten cases of bacilluria and cystitis has been recorded in brief by Horton-Smith in the appendix to the *Goulstonian Lectures*. He fully confirms the results obtained by Richardson as to the prompt and energetic action of urotropin in causing the disappearance of the bacilli and the relief of the inflammatory trouble.

The causation of bacilluria as explained by Horton-Smith is the rapid growth of the bacilli in the urine itself while contained in the bladder, an occasional micro-organism filtering through the kidneys. The fact that the typhoid bacillus can grow in the urine was proven by him, although in two out of six samples growth did not occur until the end of forty-eight hours. If this theory is correct the importance of frequent evacuations of the bladder in this disease is very great. The apathetic condition of the patient and the frequent presence of stupor make this point well worthy of our attention. It is readily seen that in cases where the urine is retained for a long time, or where the mucous membrane of the bladder is in an unhealthy condition, cystitis could readily occur.

Curschman¹ has noticed the results obtained by fourteen different observers in regard to the presence of typhoid bacilli in the urine, and concludes from this that the specific bacilli can be found in from 15 to 30 per cent. of all cases of typhoid fever. He relates three cases of cystitis produced by the Eberth bacillus. In all three the urine was acid and contained no cells from the kidneys or their pelves. In two of these cases he could discover no reason for the pathogenic action of the bacteria in the bladder wall. In his third case, however, he thinks that the age of the patient (fifty-seven years) may have allowed the bacillus to produce inflammatory change because of the lowered vitality of the tissues.

Another case of cystitis, apparently due to typhoid infection, has been reported by Brown.² The inflammation of the bladder followed an operation upon a myomatous uterus. Thirty-five years before there had been an attack of typhoid fever, but no sequelæ were noted following it. On the day of the operation the urine was normal, but on the eighth day thereafter there was complaint of pain in the bladder and a copious deposit of pus in the urine. Cystoscopic examination

¹ Münch. med. Wochenschr., October 16, 1900.

² New York Medical Record, March 10, 1900, p. 405.

showed a congested mucous membrane, without ulceration. Upon the day on which the bladder symptoms began the urine was withdrawn by catheter, with all precautions for avoiding contamination. In the urine so obtained there were a large number of actively motile short bacilli in pure culture. These reacted to all the tests for the Eberth bacillus, including agglutination. The cystitis resisted irrigations of borax, but the urine became sterile seven days after beginning the employment of urotropin in doses of 5 grains twice daily. He explains the presence of the bacilli in the bladder as being due to introduction from without by the catheter.

Involvement of the epididymis or testicle during infection with the typhoid bacillus has attracted considerable attention during the last two or three years. Pierre Chalon¹ states that it attacks young subjects, especially during convalescence, and that there is little relation between its occurrence and the gravity of the original disease. The complication may be due to Eberth's bacillus alone or to other micro-organisms producing a secondary infection. He believes that the former can be carried to the testicle either by the urethra or by the blood. Pierre Do,² in his thesis analyzing thirty-seven cases, concludes that the trouble is not due to thrombosis of the testicular vessels (a phlegmasia alba dolens of the plexus of the cord), but that it is a true testicular inflammation. He differs from Chalon in believing that the Eberth bacillus comes by way of the blood and not by way of the urethra. Both the authors quoted speak of the great preponderance of involvement of the organ on the right side. Among Do's cases, in nine the testicle alone was affected; in one the epididymis alone. In the majority of cases both testicle and epididymis are affected, and the cord is usually involved and enlarged, although the tunica vaginalis is rarely implicated. Do states that the testicle is not often the seat of secondary infection unless suppuration is found, and even in these cases the pus has shown a pure culture of Eberth's bacillus. Out of his collection of thirty-nine cases eight ended in abscess. Chalon states that the function of the testicle is frequently compromised. An instance of this complication is reported by Lannois and Loeper.³ In their cases the complication did not occur until the thirty-eighth day of the disease and after convalescence had begun. It was also peculiar in that the left testicle was affected. With the occurrence of the complication there was an increase in the agglutinating power of the serum, and the sterile fluid obtained by puncture of the tunica vaginalis had an agglutinating power equal to that of the

¹ Paris Thésis, 1899 to 1900; Abstract in *Gaz. hebd. de Méd.*, March 4, 1900, p. 213.

² Lyons Thésis; Abstract in *Gaz. hebd. de Méd.*, April 22, 1900, p. 375.

³ Abstract in *Gaz. hebd. de Méd.*, May 24, 1900, p. 484.

blood-serum. Ehrlich's reaction, which had disappeared, also returned with the occurrence of the complication, while the eosinophiles, which had reappeared in the blood during convalescence, again disappeared. Puncture of the testicle one week after the appearance of the complication gave a little blood, which showed a pure culture of the typhoid bacillus. As the testicular inflammation subsided the eosinophiles again appeared. A small collection of pus formed later, and from it was obtained a pure culture of the typhoid bacillus.

RESPIRATORY SYSTEM. The subject of pleurisy in the course of typhoid fever has received considerable attention during the past year. Labiche¹ has treated this subject at considerable length. He states that it is a relatively rare complication. It occurs usually during the decline or during convalescence, although sometimes it has been witnessed at the onset or during the prodromic period. Sometimes the pleurisy is primary, sometimes concomitant with the pleuropneumonia. Its onset may be accompanied by no symptoms, or there may be present a stitch in the side, with chill, dyspnoea, and rise of temperature. The course is variable, but usually slow, insidious, and in the majority of cases ends in suppuration. The prognosis is grave. He states that it may be due to a primary infection by the typhoid bacillus or to a mixed or secondary infection, and that the typhoid bacilli alone can cause a purulent, hemorrhagic, or serofibrinous pleurisy.

In regard to etiology, he looks upon these pleurisies as a local specific manifestation of the bacillus of Eberth. Males seem to be more liable than females in the proportion of ten to one, and the frequency with which it occurs in adults is possibly due to the greater frequency of this infection in this class rather than in those of less age. The left pleura is affected in six out of eight cases, and this predilection is supposed by him to be possibly due to the neighborhood of the spleen. He states that in the majority of cases the fluid present is purulent, brownish, and cloudy, without odor, and of variable quantity. The agglutinating power of the fluid seems to vary. He states that the temperature-curve is not a reliable guide as to the character of the fluid. While he gives the prognosis as grave, he records seven cases in which cure occurred out of a total of ten. Twice the cure occurred spontaneously; in three it occurred after thoracentesis; in two after an operation for empyema subsequent to thoracentesis. Of the three deaths in the series two were due to tuberculosis. He advises that surgical interference should not be too quickly employed, as in some cases the fluid disappears spontaneously.

Two papers bearing on this subject have appeared in the *Bulletin de*

¹ Gaz. hebdomadaire de Médecine, February 26, 1899, p. 193.

la Société Médicale des Hôpitaux during the past year. Widal and Merklen have reported three cases. In two the effusion appeared in the left side; in two the effusion was slight, and only a few cubic centimetres were removed by puncture, while in the third 250 c.c. were obtained. In only one of the three cases did the fluid remain serofibrinous to the end. In the other two it became hemorrhagic. In two cases the effusion was loculated, in one of which puncture in the middle region of the thorax gave pus, while puncture at the base gave a serofibrinous pleurisy, which later became hemorrhagic. In the purulent focus from this case a pure culture of the bacillus of typhoid was found. The fluid in two of them when sown on culture media at different times was found to be sometimes sterile, sometimes containing Eberth's bacillus in pure culture. Curiously enough, it was found that the fluid had an agglutinating power usually less than but sometimes equal to that of the blood-serum.

Souques, Lesue and Ravaut, in the same volume, have reported two additional cases. One of these developed a pleuritic stitch of the left side on the fourth day of the disease. On the seventh day the pain was gone, but there was left some dulness and pleural friction. On the next day puncture gave 10 c.c. of a hemorrhagic liquid which even on direct examination gave a great abundance of bacilli having the reactions of those of typhoid fever. The signs of effusion persisted, and on the twentieth day of the disease puncture gave 2 c.c. of a purulent liquid containing the same organism. Four days thereafter, and also ten days later, hemorrhagic fluid was again obtained by puncture. Eight days after the last of these explorations puncture was negative. There was no agglutination of the bacilli in the fluid, but (a point of much interest) those grown from the fluid acted as did other typhoid bacilli with typhoid serum. The liquid obtained from the pleural cavity was very toxic and killed an injected animal in twenty-four hours.

Like the first case, their second showed evidence of pleural involvement early in the attack. While he was admitted as early as the seventh day of the disease, it was said that some days before his entrance to the hospital he had complained of acute pain in the back, especially in the right side. On the fifteenth day there was dyspnoea, with rise of temperature and signs of pneumonia on the right side. Examination of the sputum showed pneumococci, staphylococci, streptococci, and some small bacilli in groups resembling Eberth's bacillus. Signs of effusion then developed on the right side, and puncture made eight days after the onset of the pneumonia gave 10 c.c. of hemorrhagic liquid containing only one kind of micro-organisms on microscopical examination. These showed all of the culture characteristics of the Eberth bacillus. A few days later only a few drops of liquid were obtained by puncture. They

consider that the pleural trouble probably dated from the first pain which was noticed before admission. In the discussion following their paper Achard mentions a case of empyema due to the typhoid bacillus.

Another case of typhoid fever complicated by pleurisy is recorded by Siredey.¹ In this instance the pleurisy appeared twenty-one days after the temperature reached the normal. In the abstract nothing is stated as to the presence or absence of Eberth's bacillus in the fluid.

Two cases of pleurisy due to pulmonary infarct in the course of typhoid fever were reported by Galliard² at the meeting of the Société Médicale des Hôpitaux.

The same author,³ at the Thirteenth International Congress of Medicine, has reported a case of empyema due to the bacillus of Eberth cured by six punctures, with aspiration. The amounts withdrawn were respectively 250 c.c., "small quantity," "no fluid," 750 c.c., 800 c.c., 250 c.c. After the first withdrawal 50 grammes of carbolic-acid solution were injected into the pleural cavity. On the next day there were marked evidences of carbolic-acid poisoning, which passed off in twenty-four hours. The six punctures were made between the twenty-ninth and fifty-sixth day of the disease. The bacillus of Eberth in pure culture was obtained from the pus.

Gerhardt,⁴ in an earlier article upon empyema, relates the case of a patient admitted on the fourteenth day of typhoid fever, with dicrotic pulse, enlarged spleen, spots, and dulness, with increased vocal fremitus and small râles in both lungs. The temperature fell to normal; the dulness of the right side disappeared, but on the left side increased, and vocal fremitus became lessened. One week after admission a serous fluid was obtained from both pleuræ. The dulness on the left side increased, and three days later there was again obtained some serous fluid from which typhoid bacilli were cultivated. On the day following this last puncture the right side was explored and the needle gave exit to thick pus containing typhoid bacilli. Later punctures revealed no fluid. Of seven cases of empyema found by Gerhardt in the literature six recovered, two spontaneously. In two cases with pyogenic cocci also present cure was accomplished after resection of a rib. His conclusions are that the prognosis in a case of serous or purulent exudation containing typhoid bacilli alone or mixed with pyogenic cocci, occurring in the course of or after typhoid fever, is generally good, although in the case of the purulent exudate thoracentesis is usually necessary.

CIRCULATORY SYSTEM. The serious involvement of the myocardium in typhoid fever, both as a result of the prolonged elevation of tempera-

¹ Abstract in *Gaz. hebdomadaire de Méd. et de Chir.*, October 18, 1900, p. 987.

² *Ibid.*, October 18, 1900, p. 97.

³ *Ibid.*, September 13, 1900, p. 866.

⁴ *Mittheil aus den Grenzgebieten der Med. und Chir.*, 1899, vol. v., No. 1.

ture and the toxic effects of the products of the typhoid bacillus, is a subject of perennial interest. Guyard¹ considers that myocarditis is relatively rare as compared with the total of typhoid patients treated, but that it is the rule in fatal cases, even if no sign of the trouble has been present during life. He considers that the presence of a feeble first sound with the pulse-rate above 100 is sufficient to make the diagnosis. He divides the forms of myocarditis into (1) benign, which produces nervous symptoms or may pass unnoticed, and seems to recover without leaving a trace; (2) grave forms causing myocardial cicatrices and capable of becoming the origin of chronic myocarditis, and (3) fatal forms.

Guinon² has reported a case in a child, aged five years, in whom, even from the sixth day, the heart acted tumultuously. On the thirteenth day a pericardial bruit was heard, and the heart was found to be dilated, but no murmur was present until the twenty-third day, when there was found a systolic murmur at the apex. Recovery from typhoid fever was complete by the fifty-second day. The signs of pericardial involvement completely disappeared, but there remained evidence of insufficiency and possible slight narrowing of the mitral orifice. There was known to be no lesion of the heart before the attack of typhoid fever.

In connection with this report it is interesting to note a paper which Bocloglu³ presented before the Société de Biologie, giving the results of his experiments on the action of typhoid bacilli upon the pericardium and pleura. By injecting into the pericardium typhoid bacilli, either living or killed, he produced sometimes a myocarditis characterized by granulo-degeneration or granulo-fatty degeneration of the myocardium, sometimes a symphysis of the pericardium, with fibrinous blocks and the production of newly formed vessels, and in some cases where the pleura had been wounded serous or hemorrhagic pleurisy resulted.

Relapse. An interesting paper upon post-typhoid elevations of temperature has been written by Riva.⁴ He treats of the distinction between returns of the disease ("recidiv"), by which is meant a recurrence of the disease after months or years have elapsed since the primary attack, and ("ruckfall") the return during convalescence shortly after defervescence, or even while the latter is occurring. It is indeed important that a distinction should be made between relapse in the sense of a relighting and relapse in the sense of a second attack of the disease.

¹ Lyons Thésis, 1899 to 1900; Abstract in *Gaz. hebd. de Méd.*

² *Revue mens. des Mal. de l'Enf.*, May, 1900, p. 230.

³ Abstract in *Gaz. hebd. de Méd. et de Chir.*, October 18, 1900, p. 985.

⁴ *Wien. med. Presse*, 1900, No. 17, p. 764.

The distinction between the two is by no means constantly borne in mind in contributions to medical literature. In speaking of a relapse there is also too little attention paid to the fact that by this term one should only indicate a return of at least some of the symptoms of the original attack in addition to an elevation of temperature, and that a mere rise of temperature alone, even though it continues for two or three days, does not of itself by any means indicate that there is a re-infection. Riva points out what has been, of course, observed by everyone who sees much of typhoid fever, that rises of temperature are apt to occur soon after defervescence from such causes as dietetic indiscretion, psychic disturbances, having the hair cut, sudden rising in bed, sitting up too long, undergoing slight bodily strain, entertaining visitors for too long a time, and other like causes. He insists upon the fact that these are not relapses, even though they last many days, and gives illustrative cases clearly showing the distinction between these rises of temperature and a true relapse. He explains these rises of temperature upon slight provocation by disturbances of the thermogenic centres, which are easily influenced by a slight use of the muscles or by small quantities of toxic substances absorbed from the intestinal canal. In confirmation of this view he calls attention to the sense of well-being which may be present in these cases, even though the temperature be high; or, as it might be put in other words, the condition of well-being presented by these patients shows that there is but little severity in the cause of the rise of temperature, and the effects of this rise of temperature are but little manifest—a fact which points toward the upsetting of the temperature equilibrium by a cause inadequate to produce general disturbance.

The solution of the question as to the cause of true relapse cannot as yet be said to be by any means complete. Horton-Smith, in the *Goulstonian Lectures*, calls attention to the discovery of Chantemesse and Widal that the addition of intraperitoneal injection of the toxins of streptococcus pyogenes increased the pathogenic power of typhoid bacilli when subcutaneously injected, and that the bacillus so aided acquires a far greater amount of pathogenicity for other animals, even without the use of the streptococcus toxin. Making use of this fact to explain the occurrence of relapse, Horton-Smith concludes that this phenomenon is due to the fact that the immunizing properties of the body are sufficient to destroy the greater part of the bacilli, but not sufficient to destroy all, and that the virulence of those bacilli that escape may be increased by absorption of toxins from the alimentary canal, and thus cause a relighting of the disease. If this were the case we would not, however, expect to find the reformation of the intestinal ulcers in a case of relapse unless we conclude that the place wherein the typhoid bacilli best resist the

immunizing material formed by the body is in the intestinal wall. This formation of a fresh group of typhoid ulcers in the intestine upon the occurrence of a relapse is one of the strongest points in favor of the theory that the contents of the gall-bladder are a powerful factor in the relighting of the disease. Of course, the view taken by Horton-Smith is not incompatible with this view as to the part played by the bacilli, inasmuch as the toxin absorption might render active the bacilli which we know remain, often for a long time, within the gall-bladder after typhoid fever.

Suppuration. The pyogenic power of the typhoid bacillus under certain circumstances is now well established. The danger at the present time is to look upon all suppuration occurring in the course of typhoid fever as being due to this primary infection, whereas in reality the complication may be due to secondary infection. Of twelve cases of suppuration occurring in the course of typhoid fever analyzed by Horton-Smith typhoid bacilli were found in only two, and in both of these the suppuration was connected with bone, one being a periostitis of the sternum, the other of the right tibia. In the latter case staphylococci were also present. In the other ten cases typhoid bacilli were absent. The ease with which secondary infection can occur in organisms, the resisting power of which is diminished by such an infection as typhoid fever, is apparent. The importance of this secondary infection in determining the various suppurative complications may possibly at some time occupy an important position in case the present work upon serum therapy directed against various infections becomes more highly developed.

Absence of Intestinal Lesions. Ophüls¹ has reported a case of this condition in a man, aged twenty-four years, who showed positive reaction to the diazo and Widal tests. The spleen during life was enlarged. Death occurred one week after admission. At autopsy necrotizing bronchopneumonia with recent pleurisy, inflammatory softening of the spleen, enlargement and multiple necrosis of the mesenteric glands, cloudy swelling of the kidneys and pancreas, multiple necrosis of the liver, acute inflammation of the appendix, and multiple hemorrhages into the mucous membrane of the pelves of the kidneys were found. On cutting sections of the spleen, mesenteric glands, liver, kidneys, pancreas, and appendix no bacteria were found, but on culture typhoid bacilli were obtained from the spleen, and colon bacilli from the kidneys and liver. He has collected thirteen cases from the literature of the last three years, but says that in only five, including the present case, was there evidence of identification of the typhoid bacillus. He thinks that in a considerable

¹ New York Medical Journal, May 12, 1900, p. 728.

portion of the cases the bacilli have entered the system in the ordinary manner, as is evidenced by increase in the size of the mesenteric glands. He also suggests that the lymphatic structures of the intestine may have been swollen and that the swelling subsided. Most of the cases have been of slight severity, death being due to some complication usually late in the disease. The latter fact would explain the absence of active lesions in the intestines at autopsy. In some of the cases reported pea-soup stools have been present.

Treatment. **DIET.** Two years ago Dr. Thayer, in his article upon the infectious diseases in the March volume of *PROGRESSIVE MEDICINE*, abstracted very fully the article of Bushuyev advocating an increased diet in the treatment of typhoid fever. While this contribution was far more radical in its departure from the ordinary rules of feeding than any that has yet appeared, there have during the past few years been many articles advocating an increased liberality in the feeding of patients during and after their attack of this disease. During the past year this subject has received a considerable amount of attention. Part of this is doubtless due to the article mentioned above, partly also to the various articles by Shattuck advocating an increased liberality.

In an article upon the treatment and feeding of typhoid fever Wilson¹ has gone over the various objections that have been raised to an exclusive milk diet and to one containing a variety of articles. With many other authors he has noted at autopsy the presence of curds in the stomach and also in the small bowel of fatal cases of typhoid fever, and partly on this account was led to employ a variety in diet in his uncomplicated cases. In these he gives soft-boiled eggs, milk-toast, custard, cornstarch, arrow-root, wine jelly, baked apples with cream and sugar, fruit juices (such as juice from stewed peaches, stewed blackberries, etc.), tea and crackers, soups and beef juice. When convalescence sets in he adds very finely chopped tenderloin of beef or well-broiled mutton chop, chewed and the fibrous part rejected.

Fitz,² in an excellent article, which appeared too late for incorporation in the section on typhoid fever in this work last year, has given the results from the use of various articles of diet in typhoid fever at the Massachusetts General Hospital. Some of the patients were kept on a liquid diet whose chief ingredient was milk. Another series of cases under Shattuck's care were fed on milk with minced meat, raw and soft-boiled eggs, macaroni, soft crackers, toast, and puddings. Another series of cases were given chiefly strained proteid and amylaceous food. During the year in which a liquid farinaceous food was given the mor-

¹ Columbus Medical Journal, October 20, 1899.

² Boston Medical and Surgical Journal, November 23, 1899, p. 509.

tality was 14.1 per cent.; in the decade during which milk and beef-tea composed the diet the mortality was 16.6 per cent. During the years when the patients were on liquids and the soft, solid diet recommended by Shattuck the mortality was 11.3 per cent. From the years 1893 to 1899 three classes of cases were observed in regard to the frequency of hemorrhage. Among those living chiefly on milk it occurred in 10.6 per cent.; in those with strained proteids and amylaceous fluids in 16 per cent.; while in those who were given fluids and soft solids hemorrhage occurred in only 9 per cent. Fitz concludes from these figures that "a diet of soft solids not only does not provoke intestinal hemorrhage, but also rather lessens the tendency to this complication; on the other hand, a strained mixed diet may increase somewhat the frequency of hemorrhage." The average number of perforations in the various series fed in different ways was so nearly the same that Fitz doubts whether diet or treatment has any influence upon the course. The frequency of relapse under the various methods of diet fell as follows: While the diet was largely composed of milk the ratio of relapses was 13.1 per cent.; when strained proteid and amylaceous diet was employed it fell to 11.1 per cent.; and with fluids and soft solids the ratio of relapse was only 10.2 per cent. It would seem, therefore, that relapses are rather more frequent when the diet employed is composed largely of milk. Fitz concludes that "a considerable variety in diet may be permitted, not only without detriment, but also with possible benefit to the patient."

Moorehouse¹ has recorded the results of increased liberality in feeding at the Lakeside Hospital in Cleveland. Many interesting points coming under his observation hardly lend themselves to condensation at this place, and the original article should be consulted by those interested in the question. One hundred and fifteen cases were given soft diet before the temperature became normal. In a very small proportion of cases (five) slight irregularity was noted when feeding was begun from the first to the fourth day of apyrexia, while 39 cases fed on soft diet gave no rise of temperature. In 21 cases fed before the temperature became normal a rise of temperature simulating relapse followed, while in 13 cases slight or irregular fever continued for some time after feeding was begun. In 84 cases defervescence was apparently unaffected by the character of the food, while in 11 the increased liberality seemed to hasten the occurrence of defervescence. In his series the mortality was thirteen cases, all but one of these being on milk diet at the time of death. Hemorrhage did not occur, and perforation was only seen in one case, and in that the accident happened nine days after the patient had been on milk diet.

¹ Boston Medical and Surgical Journal, November 15, 1900, p. 494.

Morris Manges¹ has also written upon this subject. His experience with greater generosity in feeding typhoid fever covered a period from May to August, 1899. The series of cases was one unfavorable to any form of treatment, as is seen by the following table :

Total number 90.		Full number.		Number on liquid diet, 82.	
Total deaths	11	12.2 per cent.		13.4 per cent.	
" relapses	14	15.5 "		14.5 "	12 cases
" perforations	4	4.4 "		4.88 "	
" hemorrhages	3	3.3 "		3.5 "	

Among the eight cases treated with fluids and soft solids there occurred no deaths, hemorrhages, or perforations. There were, however, two relapses among these eight patients. The diet employed included soft-boiled eggs, milk, milk-toast, custard, strained jellies, chicken, rice, farina, strained oatmeal and other cereals, softened soda crackers, and baked potatoes. All of the patients relished their food and sat up in bed to eat it. Among those fed in this manner there was no more diarrhoea than among other patients, while in several constipation was present. In all cases the tongue was moist, even though coated. Emaciation was less rapid than among those on liquids alone, and the loss of red blood-corpuscles was less. The series also showed no thromboses. Of the two cases that had suffered relapse after feeding with greater liberality one only had his relapse three weeks after his discharge from the hospital, the other had a mild primary attack and two severe relapses, in the first of which she was fed on milk alone, and yet had a second relapse. Manges calls attention to what cannot be too much insisted upon at the present time, namely, that typhoid fever is not an intestinal disease, and that as early as the fifth day the bacilli may be found in almost any part of the body. He also states that milk produces more virulent toxins than any other form of food.

Marsden² has also contributed an article upon the same subject, based upon 200 unselected cases. All of his patients received only milk at first. A patient with a mild attack and without contraindications received on successive days bread and milk, with custard, fish with mashed potatoes, chicken, bread and butter, and, finally, minced meat. At this stage the increase in diet was stopped until convalescence was well established. While solid food was not forced upon a patient, if he expressed a wish therefor it was given to him. In 100 cases fish was allowed prior to the termination of the defervescence ; in 36 it was given on the day on which defervescence was completed, and in 64 was given after the temperature reached normal. In 61 of these cases diarrhoea was absent throughout. In 21 cases where diarrhoea was present

¹ New York Medical Record, January 6, 1900.

² Lancet, January 13, 1900, p. 90.

at the time the fish was given this symptom was not increased. Among his 200 cases hemorrhage occurred in 6; in 4 of these the accident happened before any solid food was given, while in the other 2, although the patients had been taking solids very shortly after their admission, hemorrhage did not occur until the third and fourth weeks, and was then slight. No case of perforation occurred among the 200.

In regard to the influence of feeding upon temperature, Marsden states that in 180 the feeding produced no alteration; in 11 temporary exacerbations of temperature occurred, while in 7 the change in temperature was found to be connected with a relapse. True relapses occurred in 27 of the 200 cases (13.5 per cent.); intercurrent relapse was noted in 12 others, in 11 of which the relapse occurred before the change in diet, while in 1 it apparently coincided with the giving of fish.

Vaquez¹ has also advocated a more liberal diet, while Eichhorst² has advocated an exclusive milk diet until the third day of apyrexia, upon which system he has seen only 64 relapses occur among 1154 cases.

Stimulated by some of the earlier articles which have been quoted above, and feeling from their perusal and from reasons elsewhere stated that milk was by no means the ideal diet for typhoid fever patients, I had determined to be more generous in feeding the typhoid cases that came under my care during my term of service at the Pennsylvania Hospital, which has just been completed. For my purpose it was unfortunate that the number of typhoid fever cases admitted to the hospital during the past three months has been remarkably small—so small that I can draw no conclusions as yet from my personal experience. With this small number of cases I have been guided to some extent by the desire or lack of desire for food on the part of the patients, and so far have seen no reason to look upon this course with regret. To the small number of patients that I have happened to have under my care I have given junket, vanilla ice-cream, plain egg-custard, and soft-boiled egg as soon as the patient expressed an eager desire for food. In some of these the desire for food returned as much as a week or ten days before the temperature fell to the normal point or presumably would have fallen to the normal point under any circumstances. After forty-eight hours of this mild increase in the diet list very soft milk-toast and rice-pudding were added, and within a day or two after the fall of temperature to normal the patients have been allowed to eat chicken, boiled rice, and bread and butter. In only one of the small series of cases did I have any doubt as to the harm-

¹ *La Presse Médicale*, February 10, 1900.

² *Therapeut. Monatshefte*, October, 1900.

lessness of increasing the diet. This case was a young man who almost from his admission kept clamoring for food. As there were no marked intestinal symptoms he was given the articles first mentioned above from early in the course of his attack. In spite of his increase in diet his appetite seemed so insatiable that he was given a still further increase to the ordinary convalescent diet before his temperature fell to normal. Apyrexia was not reached until about the thirty-fourth day of the disease, and I never felt quite sure that, even in the absence of any symptoms on the part of the digestive tract, our liberality was not the cause of his prolonged slight elevation of temperature. However, I do not believe that the patient would have consented to remain in the hospital had we removed a single article from his bill of fare, and this fact, together with the absence of any digestive disturbance, caused me to feel justified in continuing our plan.

I am sure that in the small series which I have watched—although, as I have said, it is too small to warrant the drawing of any inferences or the compilation of any percentage tables—the patients on getting up from bed certainly seemed stronger and more vigorous than is usual on a more restricted diet, and they were capable of an earlier return to work. It might be said, although this statement should count for very little, owing to the small opportunities for observation, that in no case was there intestinal hemorrhage, perforation, or sequelæ up to the time of writing, and that the only deaths that occurred in the ward from typhoid fever were such as were capable of taking almost no nourishment even in liquid form.

HYDROTHERAPEUTICS. The well-known work of Hare, of the Brisbane Hospital, in advocating the systematic employment of cold baths in the treatment of typhoid fever, makes an article by one of his colleagues, Eugen Hirschfeld, upon the employment of the tepid bath one of considerable interest. The period of his observation covered three years; during the first of these he used baths at “the natural temperature of the water.” Among 266 cases in this year he had a mortality of 7.2 per cent. During the next year he treated the patients for a time in the same manner, but later substituted the employment of tepid baths for the cold baths. During this year among 147 cases the mortality was 7.5 per cent. In 1899 the tepid bath alone was used, and in 120 cases there was a mortality of 3.4 per cent. The treatment employed by him has been as follows: The patient receives a preliminary purgative of calomel or castor oil in the early cases and when purgation seems requisite. The temperature is taken in the rectum every three hours, and whenever it reaches 102.2° during the day, or 104° at night, a bath of 85° is given. The usual duration of the bath is twenty minutes. In later baths the temperature is either

raised to 90° or lowered to 80°, according to circumstances, the lower temperature being only required once among his cases treated during the last year.

His conclusions in regard to the result of the baths are: 1. That the average fall of temperature obtained is 1.5° to 2° F. 2. In a large number of cases a bath of 85° will bring about a greater reduction than one of 80° of the same duration. 3. In a small number of patients, principally the aged, the weak, and children, a bath of 90° is more effectual than one of 85°. 4. There were a few cases that offered considerable resistance to refrigeration through tepid baths.

His explanation of the good result upon the temperature brought about by the tepid baths bears out precisely what was said in this respect in the volume of *PROGRESSIVE MEDICINE* corresponding to this in the last year. In the present article Hirschfeld only deals with the question of pyrexia, saying that the consideration of the effect of the tepid bath upon other symptoms must be reserved for other articles. It is a pity that the author has not been able to combine a description of the effects upon the other symptoms at the same time that he has noted the effect upon the temperature. All those who have used hydrotherapy in the treatment of typhoid fever agree that the effects produced are not limited to the reduction of temperature, but that the nervous, circulatory, and respiratory systems are all benefited. While agreeing fully with the author of this article that tepid baths are capable of producing as much or greater benefit than the cold baths, I can readily see that the objection will be made by the strict adherents to the Brand method that the lowering of temperature is the smallest of the results produced by the cold baths. From my own experience I should say that, except in occasional circumstances, equally good results were obtained with the warmer temperature without so much inconvenience and annoyance to the patient. It is to be regretted also that the author makes no statement in his article regarding the frequency of hemorrhage under the employment of the tepid bath, as it is granted by even the most ardent advocates of the strict Brand method that the frequency of hemorrhage is increased by the employment of the cold baths. The reason for this is not difficult to find when we consider the tremendous overfilling of the bloodvessels of the interior that must occur upon the sudden contraction of all the arterioles of the skin.

Wilson and Salinger¹ have contributed an article upon the Brand method of treatment of typhoid fever, based upon an experience with 1904 cases, some of which have been previously reported. Among these 1904 cases 143 died (7.5 per cent.). One of their tables is interesting as

¹ Philadelphia Medical Journal, March 3, 1900, p. 510.

showing the wide variation in mortality among a small series of cases all of which were treated by the same method. Grouping their cases together into consecutive series, they have found that for different groups the mortality varied from no deaths at all up to as much as 18.4 per cent. Such a table as this well proves the error of endeavoring to generalize from any but a large series of cases such as these authors have employed. From the study of their cases they conclude that the Brand method of treatment neither averts nor diminishes the frequency of hemorrhage, but that perforation is less frequent under its employment, and that the danger of complications is diminished, while relapses are somewhat increased. They conclude also that albuminuria is more frequently present in cases treated by systematic cold bathing than in those not so treated. As a result of his experience at the German Hospital, Wilson has modified the systematic plan of cold bathing as advocated by Brand. One of these is the use of the bath when the patient's temperature reaches 101.4° F. instead of at 102.2° F. During defervescence and for a short time thereafter one or two plunges daily or every other day are given, with, in the author's opinion, the result of hastening convalescence. As is known from previous writings by Wilson, unless contraindicated, the patients are allowed to walk to the tub—a proceeding that is by him supposed to be not only harmless but beneficial. In spite of criticisms upon this proceeding which have recently appeared, Wilson adheres to his view that the allowing of the milder and the improving typhoid fever patients to walk to the bath is a perfectly proper proceeding.

MEDICATION. Faisans¹ has employed yeast in the treatment of ten cases of typhoid fever, with apparently good results. In one case the immediate improvement was striking. In all the tongue improved and diarrhoea diminished or disappeared. One death occurred after the treatment was instituted.

Preventive Inoculation. During the past year a considerable number of reports have appeared in regard to antityphoid inoculations. In spite of the large amount of work that has been done upon the subject there are so many natural difficulties in the way of appreciating exactly the value of the measure that such reports are very timely and demand notice. A. E. Wright,² to whom more than anyone else we owe what knowledge we have of this procedure, has given statistics bringing the matter practically up to date in so far as concerns the British army. Several points in the article are repetitions of what is already known, but the subject is one of such importance and the author is such an

¹ Bull. et Mém. Soc. Méd. des Hôp., May 25, 1900, p. 627.

² Lancet, January 20, 1900, p. 150.

authority upon it that it may not be out of place to recapitulate the main points of his article.

The vaccine used was composed of four-weeks-old cultures of a virulent typhoid bacillus to which had been added 1 per cent. of lysol. They had been sterilized by an exposure to a temperature of 60° C. From 0.5 to 0.75 c.c. were used for each inoculation. In other cases an agar culture was used which had been grown for twenty-four hours at a temperature of 37° C., and afterward sterilized at 60° C. or higher. Of this material 0.3 to 0.5 c.c. was used as a dose. Some of the inoculations were made upon troops among whom typhoid fever had already occurred; others upon those in whom a typhoid epidemic was at the time present. The results that he has collected up to date show that 11,295 were under observation. Of these 2835 were inoculated. Of the inoculated 27, or 95 per cent., suffered from typhoid fever, while of the uninoculated 213, or 2.5 per cent., suffered from the disease. Five cases died among the inoculated (0.2 per cent.), while 23 (0.34 per cent.) of the uninoculated cases of the disease died. These are large numbers, and the results would certainly show that the method is worthy of further trial, especially in view of the fact that with a condition where there are so many possibilities it is important to get as many collective investigations as is possible. Some of the difficulties in the way of appreciating the value of such statistics are brought forward by Francis H. Welsh in a letter to the *Lancet*, appearing shortly after Professor Wright's article. It cannot as yet be considered settled for just how long a time protection is afforded by the inoculation.

Wright¹ has published the results of the use of antityphoid inoculation in the garrison besieged in Ladysmith. As they were under careful observation, the cases included in his table are of much value, and are distinctly encouraging as regards the use of antityphoid inoculation where exposure is likely. The numbers are sufficiently large to avoid accidental error. Both groups of cases—the inoculated and the uninoculated—were placed in exactly the same situation in regard to risk of infection. Among 10,529 people who were not inoculated there occurred 1489 cases of typhoid fever—a proportion of 1 in 7.07. This is contrasted with the occurrence of 35 cases of typhoid fever among 1705 individuals who had been inoculated, or a proportion of 1 case to 48.7 individuals. Among those not inoculated the deaths from typhoid fever were 329 (or 1 death to every 32 men in the group and to every 4.52 men among those attacked). Among the inoculated 8 cases died (a proportion of 1 in 213 of the whole group inoculated, or 1 in 4.4 of those attacked). Showing, as they do, that the incidence

¹ *Lancet*, July 14, 1900, p. 95.

of the disease to the number of deaths from the disease was about seven times less among the inoculated than among those not inoculated, this series must be looked upon as encouraging for the future use of the remedy where there is great liability to infection.

Alexander G. Foulerton¹ has contributed the results of antityphoid inoculation in an asylum. They are as follows: The total number of patients in the asylum was 1650. None of these was inoculated, but they act as a basis for comparison of the members of the medical staff, nurses, and attendants who underwent the so-called "vaccination." Those inoculated numbered 84. Among the insane 88 (5.33 per cent.) cases occurred. Among the medical staff, nurses, and attendants 19 cases occurred, 15 cases before inoculation and 4 afterward. All of the latter occurred in those who were not inoculated. These numbers are not convincing, as they are few in number, and chance might have had much to do with the distribution of the cases. Nevertheless, what value they have weighs in favor of preventive inoculation.

Another article upon the use of typhoid vaccine as a preventive is contributed by R. W. Marsden.² He states that at the Monsall Hospital typhoid fever among the staff is a not infrequent occurrence. The frequency of its occurrence among the staff is shown by the fact that 18 cases occurred in the four years from 1895 to 1898. On account of this prevalence of typhoid fever among the nurses and others it was considered desirable that those exposed to the contagion in the wards should receive whatever protection was afforded by the typhoid vaccine recommended by Wright, of Netley. Among 22 nurses 14 received the typhoid vaccine. Of the 8 unvaccinated 4 had already contracted typhoid fever previously during the performance of their duties and 4 others refused to be vaccinated. After the institution of vaccination no cases occurred among the attendants; but, as the author says, the proofs are too small to allow of any generalizations.

An important point is the determination of the length of time over which the supposed preventive power of the inoculation can be depended upon. Foulerton contributed to the results nine cases which had been inoculated just twenty-four months previously. The test of the immunity conferred by the inoculation was the agglutinating power of the serum. It cannot be asserted as yet that this is a perfectly reliable test of immunity, especially in view of the fact that a relapse frequently occurs in cases where strong agglutinating power has been found present during the original attack. Foulerton found that in two of these cases instantaneous reactions occurred with dilutions of 1 in 200, while in one

¹ *Lancet*, June 2, 1900, p. 1578.

² *British Medical Journal*, April 28, 1900, p. 1017.

case instantaneous reaction was produced with a dilution of 1 in 100, and in another reaction within twenty minutes with a dilution of 1 in 50. Five of the cases showed no reaction even with a dilution of 1 in 10.

S. Osborn¹ states that at Modder River 6 per 1000 of those who were inoculated suffered from typhoid fever as contrasted with 9 per 1000 of the uninoculated. According to his experience, decided objection was made on the part of the troops to the inoculation. He states that many refused to have the operation performed because the effect was in some cases so severe, but whether he refers to the reaction and its discomforts or to pain produced by the inoculation cannot be gathered from his communication.

The discomforts attendant upon the reception of antityphoid inoculations are also well illustrated by a brief statement by Wilson,² although from the description given it would seem as though most of the discomforts were due to anticipation. One case is recorded showing the symptoms produced by the employment of the vaccination. While of short duration, the symptoms of reaction (if they may be so called) must be decidedly disagreeable.

Occurrence in Children. An elaborate study has been made by Morse³ upon foetal and infantile typhoid fever. The article was first seen so short a time before the present material went to press that there is room only for Morse's conclusions. The original article should be consulted by those interested in the subject. From a careful study of the literature he draws the following conclusions :

The typhoid bacillus can traverse the abnormal and possibly the normal placenta from mother to foetus. Owing to the fact that the bacilli enter directly into the circulation of the foetus when transmitted through the placenta, the disease is from the first a general septicæmia, and on this account intestinal lesions are absent. The foetus usually dies in utero or at birth as the result of typhoid infection. If it be born alive it is feeble, and death occurs in a few days without definite symptoms. Proof is absent that the foetus may pass through infection in utero and be born alive and well. Transmission from mother to child is not a necessary result of maternal typhoid.

In regard to infantile typhoid, he states that while there is no obvious reason for the infrequency of typhoid fever in infancy, the small number of cases reported in the literature would cause us to believe that it was either less frequent in these than in older people, or else that it is only

¹ Lancet, April 21, 1900, p. 1158.

² British Medical Journal, April 28, 1900, p. 1018.

³ Archives of Pediatrics, December, 1900, p. 881.

apparently so because the disease is not recognized. In regard to the agglutinating reaction, he states that the serum reaction occurs in infantile as in adult typhoid, but there is no evidence in regard to its occurrence in foetal typhoid. The agglutinating power can pass through the normal placenta, although part of it is arrested in its passage; so also the agglutinating power may be transmitted to the nursling through the mother's milk, and may appear in the infant's blood in less than twenty-four hours. The agglutinating power of the infant's blood ceases a few days after the cessation of nursing.

Two cases of typhoid fever in nurslings, aged respectively eleven and fourteen months, have been reported by Nobécourt and Bertherand.¹ The diagnosis rested practically entirely upon the presence of agglutinating action in a ratio of 1 to 150. In the abstract there is no statement in regard to a possible source for the infection—a point that would have been interesting to investigate.

A. D. Blackader² has reported a series of 100 cases of typhoid fever occurring in children. Four of these were under the age of two years, 13 between the ages of two and five years, 40 between five and ten years, and 43 between ten and fifteen years. In one of the cases under two years of age it is to be noted that the Widal reaction was absent, yet at the post-mortem examination typhoid lesions and the presence of typhoid bacilli in the intestines were found. Too much stress cannot be laid upon the frequent late appearance of the Widal reaction in typhoid fever as seen in children. Blackader's case died on the tenth day of the disease—a period prior to which the Widal reaction frequently fails among children, as was hinted at in the article corresponding to this in *PROGRESSIVE MEDICINE* last year. One of Blackader's cases was an infant of thirteen months and one of eighteen months. The appearance of the Widal reaction among Blackader's 100 cases was noted in 43; before the tenth day it was found in 18 cases; between the tenth and fifteenth days in 14 cases; from the fifteenth to the twentieth day in 9 cases; after the twentieth day in 4 cases. In three cases the reaction failed. Only one case died, that being a child, aged thirteen months, briefly mentioned above.

In regard to the employment of bathing, Blackader says, "I am convinced of the great value of the regular and systematic employment of the cool or cold baths in the treatment of this affection. In my opinion they should be employed without too rigid an adherence to the rules laid down by Brand. A great fall in temperature as the result of its employment is not to be desired." "The duration of the bath, the

¹ Abstract in *Gaz. hebdomadaire de Méd. et de Chir.*, October 18, 1900, p. 990.

² *Montreal Medical Journal*, September, 1900.

temperature of the water, and the frequency with which the baths are employed should be modified to suit each case in the same way as we modify the dosage of other therapeutic remedies." "A bath of 90° cooled to 85° , and repeated regularly for the first few days of the attack, gives rise to neither resistance nor signs of shock or collapse on the part of the child."

Glénard¹ contributes an article upon the treatment of typhoid fever in children by means of cold baths. He gives the percentage of deaths, derived from a grouping of statistics from various authorities, at 15 per cent. under the use of medical treatment. After quoting the statistics given by various authors who have used cold baths in the treatment of this disease in children, he states that the mortality falls from 15 per cent. among those treated medically to 11 per cent. among those treated with cold baths used simply as aids to medical treatment, and to 2.5 per cent. where systematic cold bathing is employed. He states that collapse is not observed unless the bath is too cold or too prolonged or unless the method is begun at a too advanced stage of the disease without the use of remedies directed to the state of the heart. He employs a bath of 22° C. of ten minutes' duration, with cold effusions every three hours when the rectal temperature is 39° C. or above. When the temperature is between 38° and 39° C. a bath is given only so long as the thermometer registers 38.2° C. In case the condition of the heart is not satisfactory he gives a rectal stimulant before and after the bath. In case collapse threatens he makes the effusion colder, the bath shorter, uses friction and massage during the bath, uses external heat after the bath, and if necessary an injection of ether. As no mention is made as to friction in case no collapse is present or threatened, he would seem by implication not to employ it where this condition was not to be treated. It is possible that his meaning is not exactly grasped in translating the article, but it would seem an error to look upon friction employed during the bath as simply a measure calculated to prevent collapse rather than as an integral part of the bath and necessary in obtaining full benefit from it. The ordinary idea of the purpose of the friction employed in the bath is to insure a renewal of the mass of blood contained in the bloodvessels of the skin, in order that the whole mass of blood may be cooled by being brought to the medium of a lower temperature, and also that internal congestion may be prevented.

Sequelæ. *Cerebral abscess* following typhoid fever in the absence of middle-ear disease is sufficiently rare to make it worth while to note a case reported by Brown.² In a patient, aged nineteen years, without

¹ Rev. mens. des Mal. de l'Enf., January, 1900, p. 31.

² Edinburgh Medical Journal, September, 1900, p. 228.

preceding middle-ear disease and with nothing in the past history pointing to any other etiological factor except measles, gastric ulcer, and anaemia, there was noticed near the end of an attack of typhoid fever protrusion of the tongue to the left side, contractions of the left sternomastoid muscle and tremor of the left side of the face, left arm, and leg, with slight loss of power. These symptoms entirely disappeared, but the patient later suffered from constant headaches and general poor health. In the autumn following the attack she constantly heard noises in the right ear and noticed numbness in the left hand and arm. The sensory disturbances then spread to the left side of the face and head, and the left hand began to shake, and later the arm became affected in this way, while the left leg became paretic. It appeared later that she had had a slight limp on the left side ever since her attack of typhoid fever, with jerking of her left arm and leg. On the day after admission she had convulsive movements of the left side, which began in the leg. These were repeated, the twitching previously noted became more constant, the headache became worse, and vomiting appeared. Double optic neuritis was found on ophthalmoscopic examination. Operation was consequently performed, and three ounces of pus containing staphylococcus pyogenes aureus were evacuated from the region of the Rolandic fissure, with prompt relief from all the symptoms and signs and perfect recovery.

Anterior Poliomyelitis. Gumpertz¹ has reported a case of acute infectious anterior poliomyelitis following upon an attack of a short fever, presumably typhoid, in a man, aged twenty-three years. There was decided weakness in the left arm, with total disability for some movements, with paresis of the left leg and absence of knee-jerk on the same side and absence of electrical excitability in the left deltoid. There were no sensory disturbances. Later, faradic irritability was found to be lost in the left deltoid, biceps, and supinator longus. The absence of disturbances of sensation and of pain and the presence of galvanic irritability, as also the sudden appearance, would seem to rule out neuritis as a cause of the motor phenomena. The diagnosis in regard to the primary disease is, however, not so certain from the account given, inasmuch as no mention is made as to the presence or absence of Ehrlich's reaction or as to the presence of spots or splenic enlargement, nor is the duration of the fever given.

Pseudohypertrophic Paralysis. Josserrand² reports the case of a female patient, aged twenty-seven years, who had pseudohypertrophic paralysis of Duchenne, which dated from an attack of typhoid fever which

¹ Berlin. klin. Wochenschr., April 16, 1900.

² Abstract in Gaz. hebd. de Méd., May 24, 1900, p. 584.

had occurred three years before. During the course of the original disease she had had slight myositis of the left calf, and on her discharge walked badly, and later had paralysis of all four members.

Rapid Pulse. Ordinarily after an attack of typhoid fever we expect the pulse-rate to be rather below than above the normal—"the slow pulse of convalescence." While this is not an invariable rule, it is present in the majority of cases. Burland¹ has recorded a series of observations made on board the hospital transports from South Africa upon 265 cases of convalescent typhoid fever. The lowest pulse-rate noted was 72 per minute and the highest 150. In 56 per cent. it was 80, in 25 per cent. it was 95, in 10 per cent. it was 100, in 5 per cent. it was 110, and in 4 per cent. it was from 120 to 140. It is pointed out by Burland that this unusual rapidity of rate of the pulse was due to preceding forced marches and other debilitating circumstances connected with the campaign. It might be worth while to bear in mind in connection with these cases the observations made by Da Costa during the late civil war in this country in regard to the irritable heart of soldiers seen often where there was no preceding infection. It is natural, therefore, to suppose that the ordinary rule in regard to the slow pulse of convalescence from typhoid fever might not prevail in such subjects.

Stricture of the Œsophagus. Another case of stricture of the œsophagus following typhoid fever is put on record by Pyle.² In this, as in some of the other cases reported, there was a history of pain and dysphagia during the progress of the original disease. The dysphagia persisted and became steadily more marked until the patient was seen, a year after the termination of the infection. Treatment by a special method of dilatation devised by the author of the paper produced very excellent results, and the description and cut of the original article should be consulted by those interested in the subject. Other instances have been reported by Dugan³ and Tinker.⁴

Suppuration of the Thyroid Gland. The occasional occurrence of changes in the thyroid gland during typhoid fever was briefly mentioned last year. Schudmak and Vlachos⁵ report the case of a male suffering from typhoid fever of moderate intensity who showed slight swelling of the thyroid gland on admission. During convalescence there was a relighting of fever, with a complaint of pain in the thyroid. Suppuration occurred in the gland, and on incision a pure culture of Eberth's bacillus was obtained from the pus.

¹ Lancet, July 28, 1900. ² Philadelphia Medical Journal, February 3, 1900, p. 303.

³ New York Medical Times, October, 1900.

⁴ Philadelphia Medical Journal, March 3, 1900.

⁵ Wien. klin. Wochenschr., 1900, No. 29.

Typhoidal Spondylitis. In the volume corresponding to this last year the article by Quinke upon typhoidal spondylitis was mentioned, and a case was spoken of which had occurred in my ward at the Pennsylvania Hospital. An article by Könitzer,¹ reporting a case of this trouble, was overlooked until too late to be mentioned in that volume.

In the *Boston Medical and Surgical Journal* of March 29, 1900, an article appears by R. W. Lovett and Charles F. Withington in which reference is made to cases previously reported and a new instance added. In their patient prompt relief from pain was obtained by the use of the plaster jacket. Some involvement of the cord was present, as shown by the presence of paresis in the legs, with much increase in the knee-jerks and slight ankle clonus, with small areas of anæsthesia on the outer side of the thigh. The signs indicating the pressure in the cord rather rapidly disappeared, and the patient ultimately fully recovered. This example, as was the case with all the others so far reported, occurred in a young male.

A. Schanz,² after mentioning the cases of spondylitis associated with typhoid fever reported by Quinke and Könitzer, reports an additional fourth instance of the lesion. His patient was a woman, aged thirty-six years, who had a severe attack of typhoid fever, with rose spots, positive agglutinating reaction, and slight purulent otitis and decubitus. During the course of her illness she had some inflammatory condition of the right eye, with suppuration. In the third week of her stay in the hospital she had lightning pains in her right leg and at the same time loss of power in the right arm. Two weeks later pain developed in the lumbar region, with palpable swelling; the pain was lessened by lying down. There was tenderness over the last lumbar spinous process, but no deformity or swelling. Knee-jerks were active, and there was slight adductor spasm. Plaster-of-Paris and, later, corsets were used to immobilize the spine, with the result that after about six months from her first being seen she was able to be about the house attending to her duties. He rather doubts the diagnosis of spondylitis in Quinke's first case, and his criticisms seem quite justified.

PLAGUE.

Owing to the persistence of the epidemic of plague existing in India and the occurrence of localized outbreaks in other parts of the world, as at Oporto last year and in Glasgow during this present year, its study is one that must interest everyone, no matter in what part of the world he

¹ Münch. med. Wochenschr., August 29, 1899.

Arch. f. klin. Chir., 1900, Band lxi., Heft 1, p. 103.

may be practising. Of course, to those in seaboard towns some knowledge of the disease is more necessary than to those practising in the interior. Had it not been for the theoretical knowledge of plague on the part of the health authorities and physicians in Glasgow, no one can estimate the amount of damage that might have been done, not only throughout the British Islands, but by way of them throughout the world. In the October number of the *Practitioner* there is a valuable series of articles by Cantlie, Manson, Hewlett, Rees, and Chalmers dealing with various points in regard to the natural history, symptomatology, pathology, treatment, and prevention of this disease. In Cantlie's article a valuable systematic exposition of the clinical picture of the disease as ordinarily seen, and various larval and complicated forms, is given. What little of pathology there is characteristic in the disease is briefly described, and the author then discusses methods of treatment aside from the employment of plague serum. As regards prophylaxis, public and personal cleanliness are especially insisted upon. Serum inoculation is but briefly mentioned as a prophylactic measure, probably because this portion of the subject is more fully treated of in the same journal by Hewlett. Calomel in doses of from 5 to 10 grains is advised if the patient be seen early in the disease and if the pulse be not weak or prostration very pronounced. It is advised that the purge be followed by a saline in six or seven hours. Purgation is contraindicated after some days of illness. The importance of stimulation by food, alcohol, and cardiac tonics in practically every case is insisted upon. Of cardiac stimulants, strychnine is especially recommended, digitalis being considered disappointing, probably because of its slowness of action. Musk, in 5 grain doses, camphor in doses of 2 grains, or caffeine are also mentioned as cardiac tonics; among these aconite is also mentioned in the text. It would seem that this must be either a misprint or a slip of the pen. While not devoting much space to it, the author's opinion of Yersin's curative serum is evidently not very high.

The recent occurrence of cases of plague in Glasgow makes the report of A. K. Chalmers,¹ Medical Officer of Health of that city, very interesting. The relationship between the different cases is quite marked, most of them having occurred in people who had attended a wake held over some of the first victims. The measures taken to prevent the spread of the disease should be read by all health officers and those interested in preventive medicine; a reproduction of them at this place is unnecessary.

The importance of an exact knowledge in regard to the occurrence of plague among the lower animals is supreme from a hygienic stand-

¹ *Practitioner*, October, 1900, p. 414.

point and has received a large amount of attention. In the literature of the subject there is so much that is contradictory that the article by Clemow¹ is of much interest in that it gives not only his personal experience, but also a critical summary of our knowledge in regard to this subject. His conclusions are that monkeys, rats, mice, bandicoots, squirrels, and marmots are liable to contract plague under natural conditions, and that insects are probably agents of considerable importance in the spread of plague. In regard to monkeys, he concludes that, while they undoubtedly do suffer from plague in India, there is little proof that they act to any considerable extent in spreading the disease, although the fact that they may do so should be borne in mind. Insect-eating mammals and bats are not proven capable of acting as hosts of the plague bacillus. Rodents, as is of course well known, are of all animals the most susceptible to plague. From the numerous articles upon the connection of rats with plague Clemow summarizes about as follows :

When rats are affected with plague they usually in great part disappear from the location in which they formerly resided, those that remain being attacked by the disease. This migration and mortality among those that remain have been noted in practically all of the recent epidemics. The results of a post-mortem examination made by Clemow on a rat dead of plague were that the lungs were very deeply engorged without pneumonic consolidation, while the spleen was much enlarged, the liver intensely congested, and its substance friable. Pure cultures of the plague bacillus were obtained from the spleen and liver ; no buboes were present. An interesting question is the source of infection of rats. Clemow considers infection from the soil, grain, the bodies of plague victims (rats and human), infected clothing, etc., and infected insects. In regard to infection from the soil, Clemow considers that it is proven that the soil may, under certain circumstances, contain the virus of plague, and that rats may easily become infected therefrom because of their constant grubbing with their noses in the dust and soil. He thinks also that rats may be infected with plague from grain or other food, although this is not yet absolutely proven. Infection from the cadavers of human beings or through rats dead of the plague is considered highly probable. Infection of rats by sniffing at or eating rags, clothing, or dressings from plague patients is considered likely, but not proven. In the volume of *PROGRESSIVE MEDICINE* for last year some space was devoted to the work already performed in regard to the transmission of disease by insects and to the possible spread of plague through the migration of infected fleas from rats to human

¹ British Medical Journal, May 12, 1900, p. 1141.

beings in the case of plague. Clemow's conclusions in regard to this point are that "there is very good reason to believe that plague may be and is spread to rats from other rats, and perhaps from human beings, by insects, of which probably the flea is the most important." An interesting point in regard to the spread of plague by means of rats is the determination of the distance to which these animals are capable of carrying the epidemic. Regarding the transportation of infected rats by a train, he says that he thinks it improbable that a plague-infected rat could survive for any great length of time, and that it is still unknown how long the plague bacillus can survive in the body of a dead rat. He himself has never succeeded in finding it in bodies where decomposition was present. An exact estimate of the amount of evidence regarding the transfer of plague from an infected vessel to the shore by means of rats is also given, and it is rather surprising, in view of the many statements made in regard to this question, how little positive testimony there is as to the likelihood of these means of transmission.

The bandicoot is an animal having little interest in this regard outside of India. It seems to be capable of becoming infected, although its importance is insignificant compared to the ordinary house rat. While mice are readily capable of infection by plague when inoculated in the laboratory, it would seem that they are by no means so liable to contract the disease in the natural manner as are rats. Clemow concludes that while there is one instance recorded of true plague in squirrels in the wild state, they cannot be considered as playing an important part in the transmission of the disease. There is no evidence that guinea-pigs have contracted the disease naturally, although they are susceptible to the poison in laboratory inoculations. One case is mentioned by Clemow in which porcupines in the Zoölogical Garden had died from plague, while there is some evidence to prove that marmots have played the part of carriers of the disease. The evidence in regard to rabbits is, according to Clemow, the same as that in regard to guinea-pigs. Dogs and cats would seem to be resistant to plague and to take but little part in the transmission of the disease. Horses, pigs, sheep, and cows are animals scarcely to be considered in relation to the disease. It would seem, however, that goats are more susceptible than the animals last mentioned. Birds, reptiles, and fish would seem to be refractory.

Clemow's article has been rather fully referred to because, while it may seem that there is much in what has been written above that has but little bearing upon the disease as it has existed up to the present time, yet there is no way by which we can tell at what time this disease may break out in any part of the world and require most vigorous efforts for its elimination.

Diagnosis. Hewlett¹ gives the following points in regard to the bacteriological diagnosis of this disease. Smear preparations with blood and with the fluid from the buboes are to be stained by Gram's method, and also by either methylene-blue or weak (1:3) aniline gentian-violet. They are then to be washed, dried, and mounted in Canada balsam. "The presence of numbers of short diplo-bacilli with polar staining which are decolorized by Gram's method is significant." The absence of bacilli is said to amount to nothing by the direct examination. The expectoration should be examined in pneumonic cases, the diplo-bacilli being very numerous in the sputum. These are smaller than the diplo-coccus pneumoniae, and do not stain by Gram's method. If the bacilli are found he recommends that a fresh hanging-drop preparation be made in order that the non-motile character of the bacillus of plague may be established. Agar, gelatin, and broth cultures are also to be made, and inoculation under the skin of the abdomen should be made with a little of the fluid from a bubo or with an emulsion of this material.

Treatment. An interesting question in regard to the treatment of plague which might be deserving of further consideration is mentioned by Acting Assistant Surgeon Havelburg,² of the United States Marine Hospital Service. After drawing attention to the fact that the plague bacillus in the greater number of cases enters the body by way of the skin, and from the surface is transmitted through the lymphatic vessels in suspension in the lymph, and that it only becomes located, develops, and produces its toxin in the lymphatic glands, he speaks of the localization of plague and checking of the development of the germs in the first group of lymphatic glands if the inflammation which takes place in them is sufficient to cause a production of pus. To quote his words: "From the theory thus established there results an important therapeutic question. During the progress of the disease there is a critical period in which the germ is to be found only in the lymphatic glands—a natural protective rampart, which up to that time had not been broken through. If the germs succeed in breaking through the rampart, then the consequences of the septicæmic infection by the plague bacillus are interminable." He believes, therefore, that it is important to seize upon this period, when the bacilli have been blocked in a lymphatic gland, to extirpate the infected organs, with their contained bacilli. He states that at the isolation hospital of Rio de Janeiro, Brazil, this method of treatment has been employed, and the impression of the physicians is that this surgical measure has been shortly

¹ Practitioner, October, 1900, p. 401.

² Public Health Reports, November 23, 1900, p. 2869.

followed by improvement. A descent in the temperature was noticed after the removal of the infected glands. A further communication upon the use of this treatment combined with the employment of serum is promised.

Plague Prophylactic. Balfour Stewart¹ endeavored to determine experimentally to what constituent of Haffkine's plague prophylactic this material owed its power. He concludes that the filtrate of the culture may alone be able to prevent or modify an attack of plague. He therefore feels that he can controvert the opinion of Lustig and Galeotti that the immunization is due to a nucleoproteid contained in the bodies of the microbes, as is claimed by these authors. The method by which Lustig and Galeotti obtained this nucleoproteid was by cultivating the plague bacilli in large glass dishes containing agar-agar. After the occurrence of a growth the colonies were removed from the surface of the nutrient material by means of a bone spatula. The mass so obtained was dissolved in a 1 per cent. solution of caustic potash, and this solution was then rendered slightly acid by the addition of either hydrochloric or acetic acids. The precipitate so obtained was filtered out, carefully washed and dried in vacuo, or else was immediately dissolved in a 0.5 per cent. solution of carbonate of sodium. The precipitate obtained as described above was found to be made up entirely of a nucleoproteid. Dissolved in a solution of carbonate of soda, this material was injected under the skin or into the peritoneal cavity of rats, mice, rabbits, and guinea-pigs. After the subsidence of the symptoms produced by the injection of this material the animals were infected with virulent cultures of plague bacilli and were found to be invariably resistant. Later they found that the nucleoproteid was equally powerful as a prophylactic in the case of monkeys. By experiments upon themselves and other collaborators they found that this nucleoproteid while producing a sharp reaction in man was not otherwise harmful. They claim that the use of this nucleoproteid would eliminate some of the elements of danger supposed to be present in the case of material derived from liquid cultures. They also claim that their nucleoproteid has higher toxic and immunizing power than has Haffkine's liquid, and that Haffkine's liquid is easily contaminated and its dose not definitely capable of determination.

Hewlett,² after describing the preparation of Haffkine's fluid and that of Lustig and Galeotti, gives statistics quoted from Condon ("The Bombay Plague") as follows :

¹ British Medical Journal, February 10, 1900, p. 311.

² Practitioner, October, 1900, p. 405.

Place.	Number of persons.	Number of cases of plague.	Number of deaths from plague.	Mortality per cent.
Mora	{ Non-inoculated, 581	26	24	
	{ Inoculated, 419	7	0	
Damaun	{ Non-inoculated, 7213	...	716	9.9
	{ Inoculated, 1017	23	6	0.58
Damaun	{ Non-inoculated, 5869	...	674	11.5
	{ Inoculated, 1639	64	27	1.6
Damaun	{ Non-inoculated, 4643	...	93	2.0
	{ Inoculated, 2164	4	3	0.14
Kirkee	{ Non-inoculated, 859	143	98	11.4
	{ Inoculated, 671	32	17	2.5
Khoja Community of Bombay	{ Non-inoculated, 9516	...	77	
	{ Inoculated, 3814	...	3	
Hubli	{ Non-inoculat., 17786	...	2348	
	{ Inoculated, 24631	...	388	Case mortality.
Dharwar	{ Non-inoculat., 16848	1100	889	80.8
	{ Inoculated, 4321	129	54	41.8

DYSENTERY.

The natural history of dysentery, although it has been studied for so very many years, is a subject that has been but little understood. Associated with conditions of all kinds, such as malaria, "rheumatism," and other diseases with which the connection could be with difficulty traced, ideas upon its etiology were extremely vague and as incorrectly based. Even the term dysentery was one greatly abused, and any intestinal flux wherein the discharges were composed of mucus and blood, particularly if their passage was accompanied by tenesmus, was apt to be regarded as of dysenteric nature. Even at the present day the name dysentery may be too readily applied to a condition superficially resembling that disease, whereby the true lesion may be entirely overlooked. I have once seen a case of intussusception in a child sent to the hospital with a diagnosis of dysentery because of the presence of small stools of mucus and blood, accompanied by pain and tenesmus and by prolapse of the rectum. On three occasions lately seen by me the lesion causing the complex of signs simulating dysentery was due to epithelioma of the rectum. Aside from its interest from a purely scientific point of view, the discovery of the amœba of dysentery was considered a valuable acquisition in diagnosing the true disease from those simulating it. While the discovery of the amœba has done much to facilitate the diagnosis of the disease where these parasites are found, and while its discovery has given rise to numerous interesting clinical observations, it is now known that there are cases of dysentery arising independently of any infection with the amœba.

The whole question of the etiology of dysentery was well presented by Flexner in the Middleton-Goldsmith lecture in New York in April of 1900. After discussing the various bacteria which have been described in connection with the disease, the author quoted remarks that none of the bacilli, except one cultivated by Chantemesse and Widal, had specific properties, but that they were simply ordinary species of bacteria having an exceptional virulence. After giving a *résumé* of Shiga's investigation upon the disease and his discovery of the bacillus which now bears his name and which was constantly present in dysentery, but not present in other conditions of the part, which was capable of producing experimental lesions similar to those in which it was first found, and which gave agglutinating reaction with the blood-serums of the convalescents from the disease, the author describes his own experience in the Philippine Islands during his three months' residence there.

Dysentery, as it appears at the present time in the American army of occupation, is described as occurring in acute and chronic forms. In the acute cases amœbæ were either absent or very difficult to find, whereas in the chronic forms they were commonly present, but in variable numbers. In the large hepatic abscesses which occurred in the chronic cases amœbæ were sometimes, but not always, found, while bacteria were sometimes present, either alone or associated with the amœbæ. Three illustrations are given of the acute form of the disease as examples of the type seen in Manila. In these three amœbæ were found but once in the stools, but could not be found in the intestinal contents after death, and these organisms disappeared after the use of quinine injections and ipecac by the mouth. Although death took place on the same day as that on which the negative examination was made, coagulation necrosis with exudation of fibrin and polymorphonuclear cells were found in the mucous membrane, with fibrinous pseudomembrane composed of a network of fibrin enclosing multinuclear cells. Thickening with hemorrhagic effusions and fibrin in the interspaces, with accumulation of cellular elements, were found in the submucosa. The cellular exudate was composed of plasma cells. Thrombosis was also seen in the submucous tissue. In the fibrinous exudate cocci and bacilli were found in great numbers, the bacilli resembling members of the colon group. On the other hand, in the submucosa no microorganisms were found. In contradistinction to cases of amœbic dysentery these organisms were not found in sections of the gut. Studies in the bacteriology of Philippine dysentery were made either by utilizing the rectal mucus or by obtaining material from the intestine immediately after death. Pyogenic cocci were found constantly. Two types of bacilli were discovered, the first, of about the size of the bacilli coli

communis, with moderate motility and not staining by Gram's method, grew upon all culture media and did not liquefy gelatin. There was no fermentation of the sugars; litmus milk was rendered alkaline with coagulation, while indol was not formed constantly. In many cases a positive result was obtained when tested for agglutination with the blood-serum of dysenteric patients. The same bacillus could be cultivated not only from the stools during life, but from the intestinal contents, intestinal mucous membrane, and mesenteric glands of cases coming to autopsy. The bacillus was pathogenic for animals.

The second type of bacilli which were constantly present resembled the *B. coli communis*. An interesting point was found in the fact that the bacilli of this type were agglutinated by the blood of the patient from whom they were obtained, whereas this phenomenon was rarely produced by the blood of another person. Examination of the dejecta from healthy people or those suffering from beri-beri demonstrated the absence of the organism. Flexner believes that the bacillus found by him is identical with that obtained by Shiga in Japan. In a case studied by him where the disease was contracted in Puerto Rico the same bacilli were found as in the cases observed in the Philippines.

The following differential points between the bacillus of Shiga and the bacillus of typhoid fever are given by Flexner: "Shiga's bacillus shows less marked motility when first isolated and a tendency to lose motility rapidly in artificial cultivations. It displays a more uniform generation of indol. After a brief preliminary acid production in milk it gives rise to a gradually increasing alkalization. It is inactive to blood-serum from typhoid cases, but reacts with serum from dysenteric cases to which the *B. typhosus* does not respond."

Blood-serum from convalescent soldiers and others suffering from chronic dysentery acquired in the Philippines were studied in regard to their agglutination reaction. The bacillus was agglutinated by the blood of those known to have been infected with this micro-organism, while the blood from chronic dysenteric cases gave more variable results. He quotes Lieutenant Strong, who pursued the study after Flexner had left Manila, and gives the confirmatory evidence of fourteen cases of dysentery without amœbæ, showing in all the bacillus described by Flexner in the cases coming under his notice.

In regard to the importance of amœbæ in the etiology of dysentery, Flexner concludes that they are not necessarily pathogenic when found within the intestine; that amœbæ when combined with bacteria may cause intestinal lesions, and that the amœbæ alone can produce liver abscess; or, as he sums it up in a final conclusion, "The pathogenic action of amœbæ coli in many cases of tropical and in certain examples of sporadic dysentery has not been disproved by the discovery of amœbæ

in the normal intestine and in diseases other than dysentery. While amœbæ are commonly present and are concerned in the production of the lesions in subacute and chronic dysentery, they have not thus far been shown to be equally connected with the acute dysenteries even in the tropics. In the former varieties bacterial association probably has much influence upon the pathogenic powers of the amœbæ."

An interesting *résumé* of the work already performed in the production of an antitoxin against Shiga's bacillus is given.

Another valuable contribution to the knowledge of epidemic dysentery is a paper by Acting Assistant Surgeon Stuart Eldridge, of the United States Marine Hospital Service, which appeared in the *Public Health Reports* of the department in which he serves. After giving a history of the epidemic of dysentery which has been prevailing in Japan for the past twenty years, and which involved the infection of 1,136,096 people and caused 275,308 deaths, the author goes into a careful study of the causes of the disease and its distribution. It is distinctly a disease of summer and early autumn, prevails especially in rural districts and in low, damp localities. From his study of the outbreaks of the disease and the recurrences thereof in different districts he believes that it is probable that there is a period of immunity after an attack extending over a period of from five to seven years. While the mode of transmission is usually by way of the evacuations contaminating food or drink, or by emanations from accumulated fecal matter, the germs possibly being transmitted through the air for a short distance, local infection through the anus is considered a possible way of infection. The greater prevalence of the disease in rural populations is attributed to the infected material being carried by the numerous small streams running through the country and which are readily contaminated by the fecal matter used as a fertilizer. A good description of the course of the disease is given, but as it differs but little from those appearing in many of the descriptions previously published it is unnecessary to quote it in this place. It is to be noted, however, that abscess of the liver rarely follows, so that the author had never seen a case, and after diligent inquiry was unable to learn of one that was certainly authentic. Stricture of the intestine also is seldom seen, even when the disease has become chronic.

After a description of Shiga's bacillus and its properties he details the use of a serum antitoxic to the dysentery bacillus and gives the results so far obtained by its use. The serum is obtained by employing as an immunizing fluid twenty-four-hour-old agar cultures dried in vacuo. Upon employing this serum upon sheep and horses it requires respectively one and two year treatments by injection in order that they may become immune. The blood is taken from the immunized animal.

serum is obtained from it by the usual method in such procedures, and from 20 to 40 c.c. are injected subcutaneously in divided doses throughout twenty-four hours in the human being. Injections are required but seldom after the second or third day. No manifest reaction takes place except that in some cases transitory urticaria appears, especially in the neighborhood of the puncture. Eldridge has summarized the results obtained from treatment by the serum among 266 cases, with a death-rate varying in different years from 8 to 12 per cent. This contrasts favorably with the death-rate of 28.5 per cent. that prevailed among cases treated at Tokio during the same period.

In regard to the serum treatment of dysentery Eldridge concludes as follows :

“Whether the serum treatment of dysentery can be rendered sufficiently easy and inexpensive to allow of its very extensive use under existing conditions in Japan remains to be seen. At present the first cost of the necessary animals and the expense of keeping them during the long term demanded for their immunization, and the comparatively large doses of serum required, render it impossible that this method of treatment can be largely adopted save by direct and munificent governmental assistance, an attempt to secure which will undoubtedly be made before long.”

Émile Mainguy¹ speaks of the rarity of amœbic dysentery in Europe, and attributes the epidemics that have been witnessed to the influence of the colon bacillus. He states that in certain centres the mortality has reached as high as 50 per cent., and that there is great disparity between the mildness of the intestinal manifestations and the great gravity of the general symptoms. A series of cases occurring at Aubervilliers are reported which were characterized by a benign course and by the presence in the intestine of a special bacillus very virulent to animals, causing in them diarrhoea with, in certain cases, ulceration localized in the large bowel. In the abstract, to which alone I had access, there are no facts which would make it possible to identify this bacillus with that described by Shiga in the epidemic dysentery in Japan.

Kruse² states that in Barman no case of dysentery had been present for twenty years until, in 1899, 600 cases occurred, with 66 deaths. At autopsy diphtheritic inflammation of the colon was found. In 24 cases in which examination was made he found a bacillus resembling that of typhoid fever, not forming gas, and being agglutinated by the serum obtained from the patients suffering with the disease.

¹ Paris Thésis, 1899 to 1900; Abstract in *Gaz. hebd. de Méd. et de Chir.*, July 15, 1900, p. 667.

² *Deutsches med. Wochenschr.*, October 4, 1900.

MALTA FEVER.

The limits in which Malta fever occurs are being gradually extended, so that at the present time the name is one that is not very appropriate and will probably have to be revised within a short time. The occurrence of the disease in certain parts of India, in one or two parts of the British Islands, and in Puerto Rico has been reported. Strong¹ has lately reported a case of this disease occurring in Manila, Philippine Islands. The identification of the disease was made not only by the clinical history of long-continued irregular fever, but by the growth of the micro-organism having the characteristics of the micrococcus melitensis after the lapse of four days upon agar. Inoculation experiments confirmed the microscopical appearance of the growth. By an unfortunate accident one of those investigating the case in the laboratory was inoculated by some of the emulsion of the organism entering the conjunctival sac. Eleven days later constitutional symptoms developed, and on the tenth day of the disease the blood-serum showed a marked agglutination of the specific micro-organism in a dilution of 1:60 in twenty minutes. The author states that during one week he found three cases whose blood-serum produced agglutination of the micrococcus melitensis in high dilution. This paper by Strong is of especial importance to practitioners in this country, now that cases of this infection may reasonably be expected to occur on the return of our troops from the Philippine Islands.

¹ Philadelphia Medical Journal, November 24, 1900.



THE DISEASES OF CHILDREN.

By FLOYD M. CRANDALL, M.D.

DISEASES OF THE NEW-BORN.

Asphyxia. The importance of maintaining the body heat during efforts at resuscitation seems now to be well appreciated by most practitioners. Many children have, undoubtedly, been lost owing to neglect of this most important precaution. Ayers¹ describes what he calls the subaqueous method. When the child is born and the cord is yet intact, a large bowl or bath-tub, filled six inches deep with hand-enduring hot water, is brought close to the mother, and the child is immersed with its neck, head, and shoulders resting in the palm of one hand and its knees in the palm of the other. The face is kept out of the water and the cord is kept free from interference with its circulation. To expand the chest the entire body is bent backward, and to compress the chest this motion is reversed. To stimulate voluntary respiration and crying the child is lifted out of the water and dipped into a bowl of cold water and immediately returned to the hot water, the chest expansion and compression being repeated, as well as the cold-water dip after several seconds. Tongue traction may be employed while the child is submerged if that method is desired.

Cyanosis. After reviewing this subject at considerable length, J. A. Hale² concludes with the following propositions: 1. The frequency with which women who suffer from pyosalpinx, endometritis, or kindred troubles lose succeeding children, points to interference with placental circulation as a causative factor in *morbus cæruleus*. 2. The time between birth and the first attack may be accounted for by the temporary clearing out of the foreign matter by oxygenation of the blood. 3. The first marked symptom is diminution of renal secretion, with sediment. 4. The advisability of the judicious use of minute doses of digitalis is evident from results obtained. 5. The importance of keeping under observation those children who have survived the primary attack until after the period of weaning and dentition is paramount. A case is reported by Escherich³ of a premature infant, cyan-

¹ Obstetrics, August, 1900.

² Stylus, May, 1900.

³ Jacobi Festschrift, 1900.

otic from birth, in which a loud, systolic murmur was heard at the base of the heart. The child died after twelve hours, and the autopsy showed a patulous ductus arteriosus, with a normal heart. There was a pneumonia of intra-uterine origin, which without doubt aided in keeping the ductus from closing.

Ophthalmia Neonatorum. Numerous papers upon this subject have recently appeared, but they contain little that is new. They are useful, however, in enforcing the importance of prevention and proper treatment in a disease which results in so much blindness. Belief in the results of Credé's method seems to be almost universal. This consists in dropping into the eye a 2 per cent. solution of nitrate of silver immediately after birth as a preventive measure and during the course of the disease when infection has occurred. Excess of silver is washed out with a normal salt solution. Ramsay¹ is one of several writers who speak highly of protargol in a 5 per cent. solution. He also uses Credé's method. Buist and McGillivray² advise the use of douches and Credé's method in every case with a suspicious vaginal discharge, and advocate compulsory notification of all cases of ophthalmia in the new-born. Weeks³ regards nitrate of silver as the most satisfactory agent. He prefers it to any of the newer drugs, and advises its employment if there is the slightest suspicion of an abnormal discharge from the mother.

Hemorrhage. An interesting case is reported by Campbell,⁴ which shows how readily an error may be made in diagnosis. The patient was five days old and showed considerable blood in vomited matter and in the stools. Close examination revealed a small crack in the mother's nipple, and it was proved that the blood had been swallowed. A case of melæna neonatorum, due apparently to infection by the bacillus pyocyaneus, is reported by Nicholson.⁵

Imperforate Rectum. Ten cases of this condition are reported by Montgomery,⁶ in all of which operation was performed. In four an unsuccessful attempt was made to find the lower end of the intestine. In one the perineal operation was successful, and in five left-side colotomy was performed. The patients were mostly from two to five days old. Only three lived. The author prefers colotomy, because it is a more certain and rapid operation, while the result is more comfortable than an uncontrollable exit in the normal position.

Premature Infants. In an extended and very excellent paper on the care of premature infants, J. D. Voorhees,⁷ Resident Physician at

¹ Edinburgh Medical Journal, July, 1900.

² Scottish Medical Journal, February, 1900.

³ Medical News, October 20, 1900.

⁴ British Medical Journal, July 7, 1900.

⁵ American Journal of the Medical Sciences, October, 1900.

⁶ Lancet, February 3, 1900.

⁷ Archives of Pediatrics, May, 1900.

the Sloane Maternity Hospital of New York, describes the management of 336 premature babies. Among these cases was a set of triplets and 18 pairs of twins; 85 were treated as infants at term, and of these 4 died—a mortality of $4\frac{1}{4}$ per cent.; 145 were put in cotton, and of these 12 died—a mortality of 8 per cent. Some of this class should have been placed in the incubator, but for lack of room it was impossible; 106 were incubator babies. Of the latter 29 died within four days; the remainder survived the fourth day. Space forbids an extended description of the incubators employed and the numerous details of management, which are given by the author at great length. The following table shows the results obtained by treatment by various observers:

Incubators.	Tarnier.	Charles.	Sloane Hospital.	Sloane Hospital, excluding those which died in a few hours
Saved at 6 months	16 per cent.	10 per cent.		
“ 6 $\frac{1}{2}$ “	36 “	20 “	22 per cent.	66 per cent.
“ 7 “	49 “	40 “	41 “	71 “
“ 7 $\frac{1}{2}$ “	77 “	75 “	75 “	89 “
“ 8 “	88 “	.....	70 “	91 “

A collective report upon the care of premature infants in Europe is published by Deustsche,¹ whose paper is based upon answers received from various hospitals. But few of the maternity hospitals use incubators. The indications for the use of the incubator, he states, are sub-normal temperature, weight below 1000 grammes, and an age below seven months. The author agrees with Tarnier in believing that proper attention to the best modern methods of care may result in the saving of seven or eight times as many children as by old methods. The statement is also made by Ransom² that among the 2,800,000 births annually in the United States there are 420,000 feeble and premature infants. While but a small proportion would require incubator management, it is evident that the number who should receive it must be large.

INFANT FEEDING.

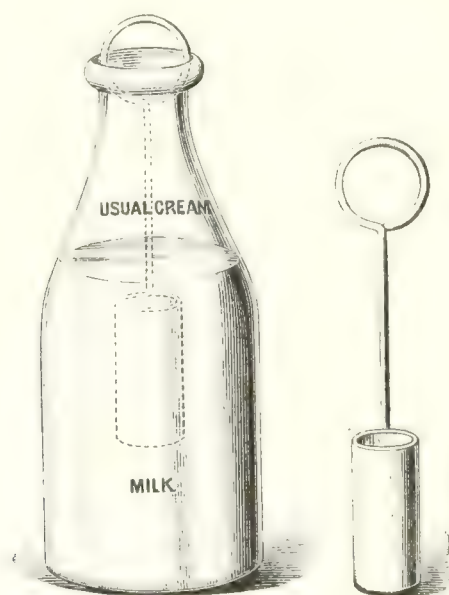
A large number of papers upon infant feeding are constantly appearing. The majority of these are little more than compilations and contain nothing new or original. It is possible to refer to but a few of the best, which represent the trend of recent opinion. Much is said

¹ Arch. f. Kinderheilkunde, B. xxiii., H. iv., 1900.
² Pediatrics, April 15, 1900.

about modified milk, and the term has no doubt misled some practitioners. A far better term is one proposed by Kerley, namely, *adapted milk*. This term signifies what modern workers have attempted to do—to adapt the milk to each infant. There is a tendency apparent toward freer use of cereals and toward greater care in securing milk for infants' use.

At the last meeting of the American Medical Association, Chapin¹ held that the most important question is that of getting the fats and proteids in a form which can be digested by the infant. The less manipulation given cow's milk, the better the results. An easy way of calculating percentages is to take advantage of the process known as the "deep-setting process of creaming." This consists in putting milk into tall vessels and cooling to about 40° F. After twelve to twenty-

FIG. 11.



four hours practically all the fat of the milk will be found in the creamy layer, the remaining milk often containing no more than 0.2 to 0.5 per cent. Milk that has been bottled and kept cool for twelve hours is subjected to the conditions necessary for "deep setting." The line separating the cream from the remaining milk is distinct. Unless the creamy layer is distinct it is probable that the bottling has not been done at the dairy, but in the place of delivery. In home modification from bottled milk the cream is readily and accurately separated from the remaining milk by means of a dipper measuring exactly 1 fluid-ounce. (See Fig. 11.) The first dipperful is taken off with a teaspoon, otherwise the milk would spill over when the dipper is let down. The successive ounces of cream are then easily removed by even an unskilful

¹ Journal of the American Medical Association, July 14, 1900.

hand. For matter of easy calculation it is assumed that the sugar and proteids are 4 per cent. each. In practice all that is necessary is to dip off the top milk of any desired richness and dilute it. The following table shows the fat in different top milks from a quart bottle of milk containing 4 per cent. fat :

6 ounces top milk contain	.	.	.	.	.	19 per cent. fat.
7 " " "	.	.	.	.	.	16 " "
8 " " "	.	.	.	.	.	14 " "
9 " " "	.	.	.	.	.	12 " "
11 " " "	.	.	.	.	.	10 " "
15 " " "	.	.	.	.	.	8 " "
20 " " "	.	.	.	.	.	6 " "

By dividing the figures in the table by the dilution average percentages will be obtained. This, according to Chapin, is as near to accuracy as percentage feeding can be brought at home, and is sufficient for the vast majority of cases. For every 20 ounces of food add 1 ounce of sugar, to bring this element up to the proper proportion. One part of sugar to 20 parts of food adds 5 per cent. ; to 25 parts, 4 per cent. ; to 33 parts, 3 per cent. ; to 50 parts, 2 per cent. An even tablespoonful of granulated sugar equals half an ounce approximately, and one scant teaspoonful equals a drachm. Half again as much milk-sugar equals the same weights. Chapin strongly advocates the use of a gruel made from wheat, barley, or oatmeal, the starch of which has been digested or dextrinized by the action of diastase. A heaping tablespoonful of flour made from a cereal is boiled with a pint and a half of water for fifteen minutes. It is then removed from the stove and set in cold water for three minutes. When it is sufficiently cool to taste, a teaspoonful of some good preparation of diastase is added, which renders the gruel thin and watery. This gruel contains the starches in soluble form, while the cellulose acts as an attenuant of the curd.

Northrup,¹ in discussing the subject, referred to the responsibility of the physician in prescribing proper modified milk. He believes that many babies are receiving milk which is behind their age in its strength. His ambition is to gradually increase until full milk is used at eight or ten months of age. Vaughan believes that the very fine modifications are often unnecessary. Sterilization and pasteurization alter milk to some extent. The chief proteid changed by a high temperature is nucleo-albumose. At 158° F. it is but little changed, and at 160° F. the change is quite marked. Stowell prefers to arrive at whole milk when the infant is six months of age. Attention is called to two points : Infants can and will digest large quantities of casein ; many physicians do not modify milk rapidly enough to keep up with the age

¹ Philadelphia Medical Journal, June 9, 1900.

of the child. Jacobi said that if anyone had come to the session with the idea that he could learn positively how to feed children, he was disappointed, for different advice had been given by each speaker. Griffith believes that sterilized milk is capable of producing scurvy, yet he believes in the process under certain circumstances. He has also seen scurvy due to a faulty use of laboratory milk, but he is a great believer in its use. Koplik said that a distinction must be made between healthy children and those that are not quite well. Milk is easily contaminated, and mothers should be taught to keep it clean. For a diluent he does not use cereals in health, but water.

In a discussion in the New York Academy of Medicine, J. Adriance¹ alleged that while it is generally accepted that cow's milk contains 4 per cent. of proteid, the most recent and accurate analyses show not more than 3.3 per cent. This error does not greatly affect the result, provided the dilution of the milk or cream is not over 1 per cent., but if the dilution is as much as 2 per cent. the resulting product contains 0.75 per cent. less proteid than intended. An important fact to be borne in mind is that as the fat increases the other ingredients materially diminish. Winters has long been convinced of the diminution of the other ingredients as the fat is increased. Many of the poor results obtained in feeding infants on modified milk can be ascribed to the use of milk containing too low a percentage of proteids. The muscular development of the child is very largely dependent upon the proteids.

Holt² believes that much of the malnutrition so commonly seen among infants could be traced to the use of food containing too little proteid, and another most potent cause is the unwise use at first of a food containing too much proteid, with the result that the digestion becomes seriously impaired, and it is impossible to make use subsequently of a sufficiently high percentage of proteid. It is a common experience for him to find infants fed on milk containing as much as 5 or 6 per cent. of fat, and always with bad results. The most common fault, perhaps, is to commence with a too large percentage of proteid, and then, having caused digestive disturbance, continuing a low percentage throughout the first year. His method is to give 0.25 per cent. or 0.50 per cent. proteid for the first few days, and then rapidly increase it, so that at the end of six weeks the child might be taking and perfectly digesting 1.5 per cent. He often gives 2 or 3 per cent. of proteid at the end of the first three months. V. Adriance believes that the slow dentition, anæmia, and loss of weight so frequently observed in the latter months of lactation are attributable to a diminution of proteids.

¹ Archives of Pediatrics, May, 1900.

² Ibid.

A common error in the feeding of children of weak digestion is referred to in an editorial article.¹ That error consists in prescribing too strong mixtures. The secret of successful feeding is to give a food which the child can digest, age and weight being but partial guides in many cases. The key to success lies in putting the strength of the mixture down to so weak a point that the child can digest it, and then to gradually work up to the point of tolerance. It is best in many cases to put the strength down at once to 1.5 per cent. of fat and 0.75 per cent. of proteids, or even lower. The strength of the mixture should then be changed every two or three days, and should not be long kept at these low percentages.

Rotch,² to whom the profession is so deeply indebted for many improvements in infant feeding, calls particular attention to the necessity of exactness. It is not only necessary for the physician to know what percentages he wishes to prescribe, but also to know what the child actually receives; hence, modification by the use of unknown milk or cream must be inexact and uncertain. Von Kanke³ advocates the use of asses' milk as a food for infants during the first two months of life. The low percentage of fat renders it useful during that period, but unsuitable for older children. In a study of the results of laboratory feeding Louis Starr⁴ divides his patients into three classes: the satisfactory, of which he has seen three cases; the particularly satisfactory, of which he has seen sixteen cases; and the unsatisfactory, of which he has seen thirty-five cases. These unfavorable results he attributes to the breaking up of the emulsion of the milk and its imperfect remixture. He believes it may be advantageously employed up to the end of the second month, and is better at any age than the ordinary haphazard methods.

It must be said that these results are very far from those obtained by a large number of other experienced men. All will agree with Dr. Starr that the introduction of the laboratory has greatly advanced substitute infant feeding by fixing the attention of the profession upon the importance of cleanliness and accuracy in the quantity and chemical composition of cow's milk foods, and by placing the whole question upon a higher scientific plane than it has ever reached before.

The sterilization of milk is now advocated by but few. Much misapprehension has existed as to its object, which is the destruction of germs, and nothing more. Toxic products which have already been formed are not changed by heat. Winter⁵ declares that we possess no

¹ Archives of Pediatrics, November, 1899.

² Jacobi Festschrift, 1900.

³ Ibid.

⁴ Archives of Pediatrics, January, 1900.

⁵ Jahrbuch f. Kinderheilkunde, May, 1900.

means of absolutely and permanently sterilizing milk. The most resisting germ, the bacillus mesentericus, cannot be killed by any number of heatings. That there are objections even to pasteurization, few will deny; but, notwithstanding its disadvantages, most physicians still believe that with present conditions it is the only safe means of treating milk in cities during the summer. Until safe milk can certainly be obtained pasteurizing seems to be a necessity.

An extensive series of experiments upon pancreatic digestion of casein is reported by Rachford.¹ The practical conclusion reached is that hydrochloric acid may be used with satisfaction in infants suffering from casein indigestion. In discussing this subject Caillé approved the use of hydrochloric acid, while Holt opposed it.

An extended review of infant feeding was given by Jacobi² at the last International Medical Congress. He refers to the variability of breast milk, and asserts that it has been presumed too much that all such milk conforms to a definite standard. In artificial feeding he believes that the heating of the food to destroy its microbial contents is one of the most notable of recent advances. Like every other student of the subject, he lays stress upon the importance of greater care in the production of milk. He seems skeptical regarding the power of pasteurized milk to cause scurvy unless the heating has been much prolonged. He is positive in his statement that the best artificial food for infants can be made by modifying cow's milk.

MILK—ITS PRODUCTION AND USE AS AN INFANT FOOD. Although much has been written upon this subject, the profession is not yet fully awake to the importance of clean milk, nor has it studied sufficiently the methods which experience has taught are necessary to obtain it. Medical men are the natural leaders in the movement to secure good milk. They should not tolerate half-way measures, and should not be found accepting milk derived from improperly managed dairies. The importance of care in every detail of production has but recently been appreciated. Rotch³ insists that in arranging for a milk supply there is no detail too insignificant to be attended to.

That pure milk can be produced, free from filth, and almost free from bacteria, has been amply demonstrated by the Francisco dairy, under the supervision of Coit and his associates; the dairies of the Walker-Gordon laboratories, and several others. The most approved method of obtaining a satisfactory milk-supply for cities is that of which the milk commission of Newark is a well-known example. This consists in placing a well-equipped dairy under the supervision of a commission

¹ Archives of Pediatrics, June, 1900.

² Ibid., November, 1900.

³ Boston Medical and Surgical Journal, July 19, 1900.

of medical men having no financial interest in its management. The dairyman is bound to the commission by a contract which specifies the various details which shall be observed in management. The last of many commissions of this character is that recently instituted in Philadelphia by the Pediatric Society¹ of that city.

The difficulties of obtaining fresh, clean milk in large cities are pointed out by Chapin,² who states that the milk-supply of New York City is derived from five States and thirty-four counties, and that the time of delivery of the milk to the consumer after milking varies from twelve to thirty-six hours. The great need of a large city is fresh, clean milk that will require neither superheating nor the addition of a preservative. From the fact that large quantities of preservatives, such as boric acid, borax, and formaldehyde, are sold in the dairy districts it is evident that the practice is still common of adding such substances to milk. Formaldehyde is particularly objectionable, as it renders the curds exceedingly tough. It can be detected by adding to a slightly diluted milk an equal quantity of commercial sulphuric acid. Pour the milk into a test-tube or flask, and then allow the acid to run in so as not to mix with the milk. A violet color will appear at the junction of two liquids if formaldehyde is present, and the curd will dissolve slowly when the tube is shaken. H. E. Alvord,³ Chief of the Dairy Division, Bureau of Animal Industry, at Washington, states that milk has certainly improved in quality in the United States in recent years. He is strongly opposed to the use of preservatives, and believes that skimmed milk is a valuable food, but it should be sold as skimmed milk. Butter fat must not be thought to be the only valuable food ingredient of milk. The value of skimmed milk is also commented upon by Stowell and the injustice done the poor by health authorities in prohibiting its sale. Skimmed milk is rich in proteid, and contains much heat-producing and bone-forming material. Chapin⁴ says that, in reference to the production of butter fat, cows may be divided into three classes: (1) Fancy full-blooded Guernseys and Jerseys giving milk containing 5 per cent. and over; (2) ordinary Jerseys and Guernseys, known as "butter cows," giving milk containing 4 per cent. and over; (3) Ayrshires, Holsteins, and common stock, known as "milk cows," giving milk containing 3 per cent. and a little over.

Prof. H. W. Conn,⁵ in speaking upon the subject of dairy bacteriology, referred to the strange fact that milk after passing through a centrifuge, although it contains less gross impurities, shows more bacteria

¹ Philadelphia Medical Journal, October 20, 1900.

² Archives of Pediatrics, March, 1900.

³ Ibid.

⁴ Journal of American Medical Association, July 14, 1900.

⁵ Archives of Pediatrics, March, 1900.

than before. This is explained by the fact that masses of dirt are broken up and large numbers of bacteria are liberated. He holds that it is extremely doubtful if localized tuberculosis in a cow can cause the presence of bacilli in the milk, unless it be in the udder itself. As primary intestinal tuberculosis is rare in man, and the germs producing human and bovine tuberculosis are not identical, there is good reason for believing that the danger of contracting tuberculosis from drinking milk had been greatly exaggerated. Additional facts supporting this are the steady decrease of tuberculosis among human beings in all civilized communities at the same time that bovine tuberculosis is on the increase. Within five years, fifty epidemics of typhoid fever have been traced to a contaminated milk-supply. While the ideal milk-supply does not by any means include either sterilization or pasteurization, Prof. Conn thinks that these methods could not at present be wholly dispensed with.

The suggestion is made by Bell¹ that in the production of milk we are asking for a technical product, and the producer should, therefore, have a technical knowledge of the manner and method of producing it. It is not enough that his dairy should be inspected at intervals, because between these visits errors will occur without recognition by a man who is not sufficiently skilled to appreciate the importance of an absolutely clean product. Therefore, the person engaged in the production of milk should be specially educated and trained. One reason for the improvement of the milk-supply undoubtedly lies in the recognition of this fact, for most of the large dairies supplying milk to the greater American cities are under the supervision of highly trained experts.

In studying the poisons in milk and milk products, Vaughan and McClymonds² found a bacillus of the colon group very generally present. They make the important observation, based upon animal experimentation, that opium does harm if given in the vomiting and purging of tyrotoxicon poisoning. In articles on the cause and prevention of infant mortality, Ernest Wende³ devotes much attention to milk as the cause of disease, and reviews at great length milk standards and recent legislation regarding them, and discusses adulterations and modern methods of dairy management.

DISEASES OF THE ALIMENTARY TRACT.

Thrush. A new device for the treatment of this somewhat troublesome disorder is proposed by Escherich.⁴ A small tampon of sterilized

¹ Medical News, July 14, 1900.

² Jacobi Festschrift, 1900.

³ Pediatrics, vol. ix., Nos. 3, 4 and 5.

⁴ Revue Mensuelle des Mal. des l'Enf., June, 1900.

cotton is impregnated with finely pulverized boric acid to which a small quantity of saccharine has been added. The cotton is then covered by a little sack of sterilized silk. This the baby is allowed to suck, which it will usually do because of the sweet taste of the saccharine. The boric acid is slowly dissolved by the saliva, and the treatment proves rapidly effective. A fresh sack should be prepared each day.

Geographic Tongue. In a clinical lecture Jacobi¹ presented a case of geographic tongue, often erroneously called psoriasis of the tongue. Such a tongue is red in spots of varying size, which are raised above the level. These are surrounded by more or less regular branching and interlacing lines, which are raised and consist of swollen papillæ filiformes and their epithelia. The condition is in itself innocent, but is a possible source of microbic invasion, as the surface is not absolutely normal. The harm comes, according to Jacobi, when the doctor tries to cure it. If it is possible at all to do this it requires a long time and an unwarranted expense.

Malignant Disease of the Stomach. Sarcoma of the stomach is uncommon at any age, but is exceedingly rare in young children. Finlayson,² however, reports its occurrence in a child, aged three and a half years. There was no pain, tenderness, or tumor, but progressive pallor, with a sallow tinge. The diagnosis was confirmed by the autopsy.

Osler and McCrea,³ in an article on cancer of the stomach in the young, state that during the first twenty years it is a clinical and pathological curiosity. Under ten years but six cases are recorded, and some of these are doubtful. The following conclusions are quoted from Matthieu: 1. Cancer of the stomach below thirty years has generally a rapid progress, and often ends suddenly. 2. Early cancer is not latent.

Ulcer of the Stomach. While gastric ulcer is very rare in children, it is not unknown. Cases have been reported in infants of four and even two months. Fischer⁴ reports two cases, one a girl, aged nine years, and the other a girl, aged fourteen years. Both patients recovered.

Hypertrophic Pyloric Stenosis in Infancy. This condition has been the subject of considerable interest during the past three or four years, and a number of cases have been reported. Opinions differ largely as to the cause, and several names have been given to it, but that given at the head of this article would seem to be the most suitable. One of the most complete papers on this subject previous to the

¹ Archives of Pediatrics, January, 1900.

² British Medical Journal, December 2, 1899.

³ New York Medical Journal, April 21, 1900.

⁴ Archives of Pediatrics, September, 1900.

present year was that of Ashby,¹ while Thomson, of Edinburgh, also reported some carefully observed cases.

Pritchard,² in a careful search of the literature, finds twenty-six cases, the condensed histories of which are given. He also reports a case of his own, making twenty-seven authentic cases. After reviewing the clinical evidence and the opinions of different observers he reaches the following conclusions: 1. The hypertrophy is secondary to overaction of the sphincter and the stenosis chiefly due to spasm. 2. The stenosis as measured post-mortem is an accurate gauge of its organic degree during life. 3. Overaction and incoördinated contractions of the sphincter may be due to some fault in the nervous mechanism. 4. Injudicious feeding may be a contributory factor of the nervous incoördination.

That such a peculiar condition should be due to a freak in development seems to Pritchard as doubtful. Meltzer appears to doubt that tonic contraction of the pylorus could lead to hypertrophy of its own coat; that it should lead to hypertrophy of the stomach walls he regards as natural enough. He says that there is no instance in animal physiology of analogous hypertrophy of a sphincter. It would be interesting to know whether the sphincter vaginæ and sphincter ani do not occasionally supply instances of such hypertrophy from over-action; but without further proof it is hard to believe that the muscular elements in the pyloric sphincter can violate so general a law in physiology.

A case is reported by J. H. Nicholl³ in which Loreta's operation was performed and the child made a good recovery. According to him, the following are the important diagnostic points: 1. Peristaltic gastric waves. 2. Periods of normal dilatation of the stomach alternating with periods in which the stomach can be felt like a ball. 3. Marked dilatation of the stomach associated with collapse of the rest of the abdomen, due to the empty state of the intestine. 4. Pyloric tumor, detected by palpation. In the large majority of recorded cases this is not mentioned. Abel⁴ also reports a case of favorable operation in an infant, aged eight weeks. The symptoms suggested stenosis of the pylorus, and the stomach-tube showed a greatly dilated stomach with the presence of lactic acid, but no free hydrochloric acid. The method of Wolford was adopted in operating.

The Diarrhœas of Infancy. In the Milroy Lectures Waldo⁵ reports studies in the bacteriology of summer diarrhœa. It occurred to him that dust might be a source of infection, particularly that blown from

¹ Archives of Pediatrics, July, 1897.

² Archives of Pediatrics, April, 1900.

³ Glasgow Medical Journal, April, 1900.

⁴ Münchener medicinische Wochenschrift, November 28, 1899.

⁵ Lancet, May 19, 1900.

the street, containing the excreta of horses. Examination of such excreta showed that the bacteria found were similar to those associated with the summer diarrhœas. He regards these discoveries, however, as merely suggestive; but it is reasonable to assume that systematic street cleaning may be a means of preventing diarrhœa. After an extended study of the bacteria that have been described as causing summer diarrhœas, Abt¹ presents the following conclusions: 1. The acute gastro-intestinal disorders of children cannot be attributed to a specific form of bacteria. 2. The toxic symptoms depend upon the introduction into the alimentary tract of poisonous substances contained in the food. 3. Bacteria may be introduced from without, or the ordinary saprophytic bacteria which inhabit the intestinal canal may take on a special virulence. 4. The most severe disturbances are caused by the metabolism of bacteria. These micro-organisms either produce acids or cause decomposition of albuminoid substances; the products act as powerful irritants to the intestines and gain access to the lymphatics, producing the local and constitutional symptoms.

The various types of stools in summer diarrhœa are described by Chapin:² 1. Stools can only be considered green when they are so immediately upon their passage. 2. Curdy lumps may be produced by undigested casein or fat; the former are hard and yellowish, while the latter are soft and smooth. 3. Slimy stools are the result of catarrhal inflammation. When the mucus is mixed with the fecal matter the irritation is high up in the bowel, but when flakes or masses of mucus are passed the trouble is near the outlet. 4. Yellow, watery stools are seen in depressed, nervous conditions, especially in the hot summer weather, when the bowel is relaxed. 5. Very foul stools are caused by decomposition of the albuminoid principles of the food. 6. Profuse, colorless, watery stools, with little fecal matter, are doubtless caused by an infective germ. These various types of stools rarely appear alone. They are frequently combined or alternate with each other.

TREATMENT. Many papers have, as usual, appeared upon the treatment of summer diarrhœa. It may be said that, on the whole, less difference of opinion exists among experienced men than was the case a few years ago. One of the best of these papers and most representative of modern tendencies is that of Kerley,³ who starts with the proposition that treatment should be based upon the well-demonstrated fact that in a child ill with diarrhœa we have a child poisoned. There may be a direct infection through contaminated food, infected feeding

¹ *Medicine*, February, 1900.

² *Journal of the American Medical Association*, July 14, 1900.

³ *Medical News*, August 4, 1900.

apparatus, or by any means whereby bacteria may pass into the gastrointestinal tract. The extremely acute cases, with excessive vomiting, purging, marked prostration, and rapid loss of flesh, are no doubt due to direct infection. Excessive heat plays an important part in infection. Through its influence the bodily functions are depressed, the bile and digestive juices are not furnished in the required strength and volume, with the result that the pathogenic organisms always present in the intestine are given an opportunity for development. The undigested milk at the temperature of the body furnishes an ideal culture medium. We thus have, at the commencement, a poisoning process at work, the contents of the intestine being involved and not the intestinal structure. In later stages we have also to deal with organic inflammatory conditions. With the nature of the disease appreciated the rational treatment is simple. It consists chiefly in elimination and diet, the endeavor being to remove from the digestive tract the bacteria and their products and to give nourishment which will not furnish a medium for their growth. If the case is of the usual type, with green, loose stools containing undigested milk and mucus, a teaspoonful of castor oil, or 1 grain of calomel in divided doses, should be given. If seen late, one-fourth of a grain of calomel in one-twentieth grain hourly doses may be given. Milk should be stopped absolutely for a period ranging from twenty-four hours to several days, as it forms a culture media for the bacteria peculiar to the disease. In its place dextrinized barley gruel may be given, to be alternated with chicken, beef, or mutton broth. The milk diet is to be resumed with great caution.

Among the long list of drugs which have been advocated there are but few worth mentioning. Kerley uses practically but four: castor oil, calomel, bismuth subnitrate, and opium. The so-called intestinal antiseptics furnish no aid in handling these cases, and are apt to upset the stomach. The new astringents have a very limited field of usefulness. Disinfection of the intestine is not possible of accomplishment with any drug known at the present time, but the development of bacteria may be prevented by other means. A culture-field must be made as inhospitable as possible. This is best accomplished by withholding milk and in the use of large doses of subnitrate of bismuth—bismuth subnitrate, 12 to 20 grains; aromatic syrup of rhubarb, 3 minims; water to make 1 drachm. The addition of aromatic syrup of rhubarb makes a very palatable mixture. The above amount is given once in two hours.

For intestinal irrigation a 1 per cent. boric-acid solution or a normal salt solution (heaping teaspoonful to the pint) is employed. If the amount of mucus is very large, or if the stools contain blood, a 1 per cent. solution of tannic acid is used instead. The temperature of the

solution should range between 95° and 100° F. Irrigation has undoubtedly been overdone. It would not seem that a colon which is frequently emptying itself would need washing out. When the movements are infrequent, however, and of bad odor, irrigation is a measure of great benefit. It should rarely be repeated more often than once in eight hours. Thorough irrigation once a day is far more useful than any number of imperfect injections. For irrigation a soft-rubber catheter, No. 14, that will not bend on itself is used and is attached to a fountain syringe, the bag of which should be held three feet above the patient's bed. The child must lie upon the back or left side, with the legs well drawn up. When an introduction of two inches has been effected the water is allowed to pass in slowly. It will distend the parts and facilitate the further passage.

Regarding the use of opium in the summer diarrhœas of children, I¹ believe that the objections urged against it by many practitioners are too sweeping. It is an active drug and must be used with much discrimination. In diarrhœa the actions chiefly desired are its power to relieve pain, to stimulate the heart, to decrease the secretions of the intestinal tract, and to check peristalsis. Of these the first and last are the most important. A study of the conditions would seem to warrant the following conclusions regarding the use of opium: It is contraindicated (1) in the first stages of acute diarrhœa, before the intestinal canal has been freed from decomposing matter; (2) when the passages are infrequent or of bad odor; (3) when there is a high temperature or cerebral symptoms are present; (4) when its use is followed by elevation of temperature or the passages become more offensive. It is indicated (1) when the passages are frequent with pain; (2) when the passages are frequent, large, and watery; (3) in dysenteric diarrhœa preceded by castor oil or a saline; (4) in late stages, with small, frequent, nagging passages; (5) when the passages consist largely of undigested food and the bowels act as soon as food is taken into the stomach.

The method of administration is of importance. The opiate should not be added to the ordinary diarrhœa mixture, but should be given alone. The dose can thus be regulated with much more certainty. This permits of the diarrhœa mixture being largely increased if the exigencies of the case require. Intervals should be sufficient to permit the effect to partially subside before the dose is repeated. They should rarely be less than four hours. Lack of precision and exactness has been the cause of much of the harm that has resulted from the use of opium in diarrhœa. Precision can only be obtained by knowing the precise amount of each dose and the exact interval at which it is given.

¹ International Medical Magazine, July, 1900.

Opium is too potent a drug to be administered with the inexactness with which chalk-mixture and bismuth are commonly prescribed.

Constipation. Recent contributions to the literature of this subject have been few in number. Doerfler¹ proposes the use of unsalted butter. Until the third month one-half to one teaspoonful may be given twice a day. Later the dose may be increased to two or three teaspoonfuls. At one year one or two teaspoonfuls are given. This seems a reasonable proposition, for increase in the fat has for some time been recognized as an important measure in the feeding of constipated infants. The action of fissure of the anus in causing chronic constipation in infants is referred to by Köppen.² The pain caused by the movement produces an involuntary attempt to check it. The author has found local treatment by ichthyol to be very efficient in recent cases. Another valuable means of treatment consists in the injection each night of a small amount of olive oil. This softens the fecal matter and protects the mucous membrane, and thus overcomes spasm of the sphincter.

Malformations of the colon are occasionally productive of constipation. Concetti³ reports a case of this character, and analyzes it together with twenty-four others reported by different observers. These he divides into three classes: 1. Those in which there is simple elongation of the colon. 2. Those in which there is increase of the transverse and longitudinal diameters and thickening of the wall. 3. Simple congenital ectasy of a portion of the colon, with or without hypertrophy and dilatation of an adjacent portion. In the first class is found an increase in length of the descending colon and of the sigmoid flexure, and these parts become doubled upon themselves. The constipation disappears as the child gets older. He proposes to call this "macrocoly." The cases in the second group are comprised under the name of "megacololy," and those in the third the author calls "ectacololy."

Appendicitis. The literature of appendicitis as it appears in children is somewhat meagre, although numerous cases have been reported. Zabriskie⁴ believes the disease to be comparatively rare during early childhood, but not uncommon after the tenth year. The youngest case, he says, on record was that of a child of six weeks, reported by Dimme.⁵ Since the writing of that paper Goyens has reported a case of perforating appendicitis in an infant, six weeks old. The diagnosis was confirmed by autopsy. Courtin⁶ insists that heredity is a factor in the etiology

¹ Münchener medicinische Wochenschrift, January 23, 1900.

² Der Kinder Arzt, March, 1900.

³ Archiv für Kinderheilkunde, Band xxvii., Hefte 4 and 7; Archives of Pediatrics, July, 1900.

⁴ Post-Graduate, February, 1900.

⁵ Gazette médicale Belge, vol. xii., No. 14.

⁶ Revue Médicale, March 14, 1900.

of appendicitis. The appendix is lymphoid in its structure, and he believes that there is a connection between adenoids and appendicitis in children. Hypertrophy of lymphoid tissue occurs readily in subjects of the lymphoid diathesis, and it is possible that it is in the direction of the hereditary nature of the lymphoid diathesis that the hereditary tendency to appendicitis occurs.

Intussusception. In an excellent article on the mortality and treatment of intussusception, Kammerer¹ advises early surgical interference. Of the bloodless methods there is but one which deserves any consideration—the injection of fluids into the rectum. This, however, is applicable only to cases in which the large intestine is involved, or about 68 per cent. Forceful injection in acute cases should not be used after twenty-four hours. In chronic cases they may be employed with impunity. The hydrostatic pressure should never be greater than four feet. He lays down the following rules: In acute cases the attempt at reduction should be made only very early, and this attempt should be made under complete anæsthesia, with relaxed abdominal walls. Hot water should be employed in preference to iced water, although the latter is said to have effected reduction when the former failed. In very acute cases the method should not be employed. After one failure laparotomy is indicated. The causes of the high rate of mortality are generally the septic condition of the intussusceptum and the necessity of extended surgical interference. Laparotomy, the author believes, is borne better by young children than by adults.

In discussing the factors in the successful treatment of intussusception, Gibson² maintains that the main feature of success depends, first, on the intussusception being found in a reducible condition and free from septic changes; and, second, that such a favorable condition can only be met by a very early interference—that is, the prognosis depends absolutely upon the promptness of relief. Under such circumstances, in competent hands a comparatively good result is to be expected. He lays particular stress upon the disastrous consequences of delay. In discussing these papers, F. H. Wiggin, W. Meyer, and A. L. Fisk strongly approved of prompt resort to laparotomy. C. G. Kerley thought that injections should always be given a trial in the early stages, but operation should certainly not be postponed more than a few hours.

The prognosis of operation, E. J. Ill believed, depends upon six conditions: 1. The length of time elapsed after the accident before the operation. An operation on a dying patient is a discredit to surgery. 2. The length of the operation; and under this heading should be con-

¹ Archives of Pediatrics, February, 1900.

² Ibid.

sidered the very great risk of anæsthesia. The operator should be ready when the little patient is receiving the first whiff of the anæsthetic. 3. Most careful asepsis. 4. Freedom from injuries to the bowel. 5. Extent of invagination. 6. The location of the intussusception.

Four cases treated by laparotomy are reported by Ray.¹ The ages ranged from seven weeks to eight months. Two recovered. Numerous cases have been reported showing favorable results, even in young infants from both operation and injection. Surgeons incline to early operation, while medical practitioners seem more conservative. The views expressed by Jacobi² undoubtedly voice very accurately the feelings of most practitioners. He holds that the injection treatment is useful, but should be employed according to a certain definite method. His plan is to be sure that the fountain syringe is not raised higher than twelve or eighteen inches above the patient. The child should be placed upon a pillow, with its head down and its hips up, and, under chloroform anæsthesia, warm water should be poured in under the pressure mentioned, and at the same time gentle manipulation should be made over the abdomen. If this attempt at reduction proves unsuccessful it should be repeated at intervals of one or two hours, two or three times, and, if still unsuccessful, laparotomy should be at once performed. He does not believe that it is justifiable to resort to laparotomy at first in every case of intussusception.

Peritonitis. Tuberculous peritonitis is a disease of decided interest, owing to its peculiar clinical course. In an excellent review of the subject Caillé³ refers to this fact, and also to the peculiar circumstance that opening of the abdomen is, as a rule, followed by an arrest of local symptoms, and may be followed by a disappearance of the tuberculous deposits on the peritoneum, as shown in certain cases in which the abdomen has been opened for some other reason for the second time. He reports thirteen cases and states that the diagnosis is based upon the abdominal symptoms, such as distention, pain, and disturbed bowel action, presence of fluid, and loss of weight. Chronic non-tuberculous serous peritonitis presents the features of an ordinary ascites, the abdominal fluid being free; whereas, it is usually not free in the tuberculous variety. It is rare to find the tubercle bacilli by microscopical examination of puncture fluid. In doubtful cases the opening of the abdomen is indicated, and will do no harm. The tuberculin test was employed in two cases, in one with a positive and in the other with a negative result. Caillé is unwilling to make a routine test with tuberculin in human

¹ Lancet, September 29, 1900.

² Archives of Pediatrics, February, 1900.

³ Archives of Pediatrics, June, 1900.

beings in the present unsatisfactory state of our knowledge of its action. To the varieties of tuberculous peritonitis hitherto formulated by various observers he adds four others: 1. Chronic tuberculous ascites (miliary form). 2. Fibro-caseous tuberculous peritonitis. 3. Fibro-adhesive tuberculous peritonitis. 4. Tuberculous peritoneal tumors.

Zabriskie¹ describes three forms of tuberculous peritonitis as follows: 1. Miliary tubercles of the peritoneum accompanying general peritonitis. This form is most common in infants, but as it presents no abdominal symptoms is rarely recognized until autopsy. 2. With ascites; this is very commonly met with. There is a production of fibrin in moderate amount and a large quantity of serum. The fluid is first in the general cavity, but later is sacculated by the formation of adhesions. The symptoms run a subacute course, varying from a few weeks to several months, there being gradually increasing malaise and loss of flesh. The fluid accumulates rather rapidly and soon becomes sufficient to distend the whole abdomen. If untreated the disease progresses until death results from exhaustion; or, less frequently, some of the fluid is absorbed and fibrous adhesions, with sacculation of the remainder, results. 3. The fibrous element predominates over the fluid, which may be absent altogether. The intestines are matted and bound together by fine fibrous adhesions, which also bind them to the abdominal walls. What little fluid there is is usually sacculated. The course of the disease is slow, and no typical symptoms are present except the progressive enlargement of the abdomen. Terrien divides tuberculous peritonitis in children into three stages clinically: 1. Irritative exudation—free ascites. 2. Membranous formation, with encystment of the fluid. 3. Agglutination of the viscera; this stage being rarely seen. Laparotomy is remarkably effective in the first stage, but its effect diminishes as the disease progresses. Drugs and hygienic measures rarely effect a cure, even in the earliest stage.

Proctitis. The essential points in the treatment of this not uncommon disorder of childhood are thus very judiciously summarized by Gant:² 1. Remove at the earliest opportunity the source of irritation. 2. Harsh and indigestible foods are to be discarded, and milk, soft-boiled eggs, soups, beef-juice, and albuminous foods substituted. 3. Clear the bowel of scybala by injections, salines, or mineral waters. 4. In mild cases cold water applied to the hips and the injection of cold water into the rectum will be sufficient. 5. Have the patient rest quietly in bed during the acute stage. 6. In chronic cases use frequent injections of astringent solutions, such as alum, zinc, silver, lead, and

¹ Post-Graduate, February, 1900.

² International Medical Magazine, August, 1900.

sublimate. When due to thread-worms, a few injections of lime-water or salt-water in conjunction with santonin internally will destroy them. If the inflammation is due to gonorrhœa, frequent injections of water, as hot as the patient can bear, do well. In a general way the treatment consists in keeping the bowels open and in correcting errors in diet.

Prolapse of the Rectum. This is the most frequent rectal disorder of childhood. As a rule, except in acute cases accompanying dysentery or other bowel disorders, it does not tend to spontaneous cure. According to Gant,¹ the essential feature of the palliative treatment consists in keeping the child in the recumbent position during defecation, thus counteracting the force of the abdominal muscles. Frequent enemas of cold, astringent solutions are valuable, such as alum, zinc, or lead. After each action a firm pad should be placed over the anus, and the buttocks should be strapped together by adhesive strips. Diarrhœa, constipation, or cough must be relieved, otherwise the treatment will fail. If these remedies do not cure, operation should be resorted to. Lineal cauterization is to be preferred. It consists in making several parallel lines about half an inch apart, beginning two inches above the anus, carrying them downward through the mucous membrane and out at the anus. After cauterization the rectal walls should be kept apart with vasellated gauze. Cumston² believes that in the majority of cases prolapse of the rectum in children will yield readily to medical treatment if instituted early. The judicious use of a rubber rectal plug to keep the prolapse reduced, cleanliness, and tonic treatment, with the use of strychnine, will give the best results. If the prolapse has for etiological factors a polypus, hemorrhoids, or other local lesion, it is evident that the surgeon's efforts should be directed toward its cure. When it has become irreducible, or when it has become constricted by the sphincter ani, and gangrene is imminent, resection of the prolapsed part is the method of choice. The methods of Nélaton, Treves, and Mikulicz are described in detail.

Diseases of the Liver. The most complete recent article upon this subject is that of Freeman,³ in which he presents observations upon descended, congested, fatty, waxy, and cirrhotic livers, focal necrosis, syphilitic disease, tuberculosis of the liver, and suppurative hepatitis. The observations were made chiefly from hospital practice, and the conclusions are somewhat at variance with commonly accepted ideas. They may be stated as follows: 1. Descent of the liver, so that the right lobe reaches below the crest of the ilium, occurs not very rarely in infants, and particularly in those in whom the liver is enlarged. 2. Fatty liver occurs very frequently in the infants and children who

¹ International Medical Magazine, August, 1900.

² Annals of Surgery, March, 1900.

³ Archives of Pediatrics, February, 1900.

die at the Foundling Hospital. 3. The condition of nutrition of the child, as expressed by the absence of fat in general, and wasting tissue, apparently has no connection with the fatty condition of the liver. 4. Fatty liver occurs rarely in the following wasting diseases: Marasmus, malnutrition, rhachitis, and syphilis, unless such conditions be complicated by an acute disease. 5. With tuberculosis fatty liver occurs not more often than with other conditions. 6. Fatty livers occur most often with acute infectious diseases and gastro-intestinal disorders. 7. The two cases of cirrhosis of the liver examined by the writer ran a comparatively acute course. 8. Focal necrosis of the liver may be a lesion of measles. 9. Waxy liver is rare in young children. The cases reported were associated with suppuration, and the spleen and kidneys also showed waxy degeneration.

A case of acute hypertrophic cirrhosis of the liver in a boy, aged seven years, is reported by Grainger.¹ The father had died with alcoholic cirrhosis, but there was neither an alcoholic nor syphilitic history in the case of the child. A case of cirrhosis of the liver in a child, aged sixteen months, is reported by Abrahams.² It was probably alcoholic, as the child was in the habit of drinking a glass of beer a day. Terrien³ gives an extended review of the hepatic lesions accompanying the gastro-intestinal diseases. The most common of these lesions is fatty degeneration. It is analogous to infectious liver, the inference being that it is due to some toxic matter absorbed from the intestine. Resolution may be complete, but the author believes that the condition may be a precursor of disease of the liver in after life.

Cyclic Vomiting. Four cases of this peculiar condition are reported by Griffith.⁴ His statements regarding the etiology and the nature of the disease are somewhat guarded. He believes that while we may naturally conclude that cyclic or recurrent vomiting may be a neurosis, if so it is of toxic origin, in some way associated with faulty metabolism. The condition of the urine and the rôle played by lithæmia or other allied condition he believes has not yet been determined with any certainty. The disease is variable in its course and manifestations, and the results of treatment are very unsatisfactory.

DISEASES OF THE UPPER AIR PASSAGES.

Diseases of the Tonsils. Quinsy is a rare disease under ten years. It occasionally occurs, however, and has been known in infants.

¹ Philadelphia Medical Journal, June 2, 1900.

² Pediatrics, March 1, 1900.

³ Revue Mensuelle des Mal. des l'Enf., February, 1900.

⁴ American Journal of the Medical Sciences, November, 1900.

Pfingst¹ reports two well-marked cases, one in a boy, aged six years, and one in a boy, aged eight years. The etiology of acute tonsillitis has been studied by Class,² who found the various anginas to be caused by the pneumococcus, diphtheria bacillus, streptococcus pyogenes, diplococcus scarlatinæ, influenza bacillus, and staphylococcus pyogenes. These may appear in pure culture or combined to form a mixed infection. The author believes that the pneumococcus is the cause of angina in children much more commonly than has been realized. He believes, in fact, that it is the causative factor of many of the fevers of childhood. Five cases of endocarditis occurring in the course of tonsillitis are reported by F. A. Packard.³ Four of these were under fourteen years. There was no rheumatic symptom present other than the angina, and subsequent history showed no evidence of rheumatic taint. An epidemic of simple streptococcus angina is reported by Damany.⁴ The patients were chiefly young boys, the youngest being a six months' infant. Streptococci were found as the causative factor.

In an important article upon the catarrhal affections of the throat in young children, Koplik⁵ tabulates the cases below twelve years of age seen among 1284 consecutive patients suffering from catarrhal angina. There were 333 of these, very few of which occurred under six months. The infrequency of diphtherial infection under one year is pointed out, which corresponds with the experience of other observers. Feer found among 4240 cases of diphtheria but 2.5 per cent. under one year. Baginsky found but one-half of 1 per cent. of diphtheria up to the sixth month of life. To these common inflammations of the pharynx Koplik applies the name of acute lacunar amygdalitis. The temperature may range quite high, and there is frequently pain, which prevents the infant from nursing, while a disordered digestion and diarrhoea are common. There may or may not be glandular swelling. Otitis is not an uncommon complication. The importance of examining the throat in every case of fever is very great.

Adenoid Growths of the Nasopharynx. The importance of this subject is apparently well appreciated by pediatric writers, and is coming to be appreciated by the general practitioner as well. An excellent paper upon nasopharyngeal disease in children is that of Huber.⁶ After an extended consideration of the symptoms and results of adenoids, he reached the following conclusions: 1. The removal of the lymphoid hypertrophies, with the cure of the associated nasopharyngeal catarrh,

¹ Louisville Journal of Medicine and Surgery, April 19, 1900.

² Interstate Medical Journal, vol. vii., No. 3.

³ American Journal of the Medical Sciences, January, 1900.

⁴ Archive Provinc. de Medicine, vol. i., No. 10.

⁵ Jacobi Festschrift, 1900.

⁶ Archives of Pediatrics, August, 1900; Jacobi Festschrift, 1900.

will restore the patency and permeability of the nose ; if done early many local pathological changes may be avoided. 2. The general health will be more or less improved. 3. The mental faculties and general intelligence will be improved. 4. Defects in speech and hearing due to nasal troubles will disappear. 5. Deaf-mutism may be relieved. 6. The functions of the taste and smell will be improved. 7. Reflex neuroses of various kinds will be modified or cured. 8. Nasal and supposed pulmonary hemorrhages will disappear. 9. Thoracic deformities will be relieved or cured. 10. The tendency to acute rhinitis, pharyngitis, laryngitis, bronchitis, and pneumonia becomes less with the restoration of normal respiration. 11. The dangers attending the presence of enlarged cervical lymph nodes will be avoided. 12. The invasion of various infectious diseases is less likely when the nasal mucous membrane is in a healthy state. 13. The danger of meningeal infection from the nasopharynx will be lessened. 14. Ear complications, particularly those incidental to the infectious disease, will be avoided or rendered less dangerous.

Some interesting facts regarding the distribution of adenoids are given by A. T. Haight,¹ from which it would seem that they occur under various climatic conditions. In Greenland, in sixty Esquimaux children between six and fourteen years of age, only sixteen were free from adenoids. In North Dakota adenoids are frequent among the Indians. Of 300 children examined in Italy adenoids were found in two-thirds. In considering the etiology of adenoids Wright² expresses his belief as to the cause in the following words: "Too much candy in the stomach, too much clothing on the back, too much coddling in steam-heated houses." He speaks especially of retrogression of the lymphoid material. While it may leave the surface smooth, it also leaves a fibrous condition which interferes with the proper function of the vascular and glandular organs of the pharynx. Hence, post-nasal catarrh is particularly liable to afflict adults who have suffered in childhood from adenoids.

Although retrogression of the lymphoid matter occurs during adolescence, in the great majority of cases, it does not always do so. Potter³ reports a case of a woman, aged forty-seven years, with large adenoids, the removal of which relieved the symptoms. A case of chronic and persistent vomiting, apparently due to adenoids, is reported by Breton.⁴ Their removal was followed by relief of the vomiting.

Sack⁵ applies the term adenitis to these conditions of the nasal

¹ Journal of the American Medical Association, December 30, 1899.

² Brooklyn Medical Journal, July, 1900. ³ British Medical Journal, June 9, 1900.

⁴ Revue Mensuelle des Mal. des P'Enf., May, 1900.

⁵ Deutsche medicinische Zeitung, 1900, Nos. 83 and 84.

pharynx. Swelling of the cervical lymph-nodes has led him to a consideration of the glandular fever of Pfeiffer. It is his opinion that the group of symptoms described under that name is caused by an acute inflammatory condition situated in the nasopharynx, and that in most cases this condition is an acute adenitis. On account of the accumulation of pus in the crypts of the gland the febrile disturbance may continue for a long time. He thinks it likely that such a condition is the true explanation of some of the cases of protracted influenza. To the list of well-known symptoms of chronic adenitis, as chronic nasal catarrh, headache, mental apathy, and earache, he adds nocturnal enuresis and restless sleep. In an extended discussion in the American Laryngological Society¹ the subject of adenoids was considered in its numerous details and many points were elucidated.

In writing upon the subject of anæsthesia in children with adenoids T. H. Halsted² gives special warning against the use of chloroform in children of lymphatic diathesis. The presence of this diathesis is a positive contraindication to its use in any operation, and particularly in mouth-breathing children. These children are always of the lymphatic temperament and have a lowered general tone of all the cells and organs of the body. Ether he regards as the only safe anæsthetic for the adenoid operation.

DISEASES OF THE EAR.

According to the classification adopted by Stout,³ the majority of the diseases of the ear occurring in childhood come under four divisions: 1. Acute inflammations of the middle ear. 2. Acute suppurative inflammation of the middle ear. 3. Chronic suppurative inflammation of the middle ear. 4. Chronic catarrhal (sclerotic) inflammation of the middle ear. The results of acute inflammation may be: Healing, transition to the chronic form, progression to the suppurative form, mastoiditis, meningitis, or sinus phlebitis. The results of chronic inflammation may be: (1) Hypertrophy of the mucous membrane; (2) granulations or polypi in the tympanic cavity; (3) connective-tissue formation, leading to adhesions between ossiculi, membrana tympani, and walls of the tympanum; (4) destruction of the mucous membrane, membrana tympani, and often the bony parts. The tympanic membrane is almost always perforated, and it may be thickened. There may be caries or necrosis of the temporal bone or the formation of

¹ New York Medical Journal, September 22, 1900.

² Philadelphia Medical Journal, November 3, 1900.

³ International Medical Magazine, May and June, 1900.

osteophytes. The secretion may vary in character and quantity, and the presence or absence of odor is not significant.

An excellent paper on the significance of earache in children is presented by T. H. Halsted,¹ from which the following conclusions may be drawn: 1. Earache in young children is generally caused by acute inflammation of the middle ear, suppurative or catarrhal. 2. Suppuration may occur without pain or without rupture of the drum-membrane. 3. In the absence of other known causes of pain the first cause to be thought of should be acute otitis media. 4. It has been shown that purulent otitis media is nearly always present in acute infectious diseases of the gastro-intestinal and respiratory tracts in young children. 5. The cause of death in infectious diseases, meningitis, and the exanthemata may be abscess of the ear. 6. Repeated earaches in children are ordinarily but a sign of acute exacerbations of a chronic otitis media resulting from adenoids.

In a paper on the occurrence of otitis media in all grave diseases of infancy Pomeroy² asserts that most of the diseases of infancy are more positively infectious than we can easily prove in adults, and that the post-nasal chamber is a distributing point for infection to the middle ear, brain, lung, stomach, and intestines. It is an incubator promoting general toxic disturbance in many cases of localized infectious diseases. The aim of the paper is to reiterate the importance of careful attention to the ears in every serious illness and to enforce the truth of the fact that in many cases there is no abnormal appearance exterior to the tympanum, even when the middle ear contains pus. Fruitnight³ reports a case which well illustrates how sometimes the extent and gravity of a pathological lesion is not reflected in the clinical history, and bases upon it a paper designed to teach the lesson that an apparently simple otitis or an otorrhœa neglected or intermittently treated at the outset sometimes terminates fatally.

DISEASES OF THE RESPIRATORY ORGANS.

The Pneumonias of Children. Although pneumonia is a disease of particular interest to the pediatric practitioner, the recent literature has not been extensive. This is, perhaps, due to the fact that for two or three years preceding the last, pneumonia received an unusual amount of attention. Treatment, especially, was so widely discussed that little remained to be said regarding it. The type of disease during the first

¹ Medical News, March 17, 1900.

² Boston Medical and Surgical Journal, January 18, 1900.

³ Archives of Pediatrics, July 1, 1900,

two years of life is that known as bronchopneumonia, but lobar pneumonia may occur even during the earliest months; after four years bronchopneumonia is rare, the prevailing type being lobar pneumonia. Typical cases of both forms are frequently seen and are perfectly distinctive. There are also intermediate forms presenting the characters of both and occurring chiefly during the second and third years. They present, clinically, a type which is not characteristic of either lobar or bronchopneumonia. It is often impossible to decide, even upon post-mortem examination, to which class the case belongs, and the doubt is not always dispelled by the microscope. Lobar pneumonia in children, while it frequently runs a severe course, is rarely fatal. Bronchopneumonia, even when primary and uncomplicated, tends to run a more prolonged course, and is always a dangerous disease. When secondary to other diseases it is particularly fatal, and is one of the most frequent causes of death during early life.

TREATMENT. Recent writers are quite unanimous in their opposition to the indiscriminate and excessive use of drugs in pneumonia. As there is doubt regarding the power of any drug over the disease, it is not strange that drugs should be used but little by men of largest experience. It is true that certain medicines are of great value in combatting certain complications, but it is yet to be proved that any medical agent possesses a controlling influence over the disease *per se*. That many lives are saved by judicious management, however, is beyond doubt. Careful feeding and hygienic management, counter-irritation and inhalations, and judicious stimulation will save more children from death by pneumonia than can be saved by the filling of weak and irritable stomachs with irritating or nauseating drugs. Patients are sometimes lost through overzealousness. Through the desire to leave no means untried, medicines and doses are multiplied, local applications are vigorously employed, the temperature is taken with unnecessary frequency, and the little patient is kept in a continuous state of disturbance and excitement, and is literally worn out for the lack of necessary rest and sleep.

In a recent discussion on the treatment of pneumonia Holt summarized his views in the following admirable manner: 1. No depleting measures are ever admissible. 2. Hygienic treatment is indicated, such as fresh air, proper feeding, and good nursing. 3. No unnecessary medication is permissible. 4. Many annoying symptoms may be relieved by local measures. 5. The administration of stimulants should be determined solely by the condition of the pulse. 6. High temperature is much more safely and effectively controlled by cold than by drugs. 7. Greater caution is necessary in the use of powerful drugs than is generally observed. 8. Rest is quite as important as in any other serious disease.

BRONCHOPNEUMONIA. In a study of the statistical records of pneumonia the mortality is shown by MacKenzie¹ to be 5.4 per cent. of all deaths under one year; between one and five years it is 6.5 per cent.; between five and ten years it is 5.6 per cent., and between ten and fifteen years it is 3.9 per cent. of deaths from all diseases. In clinical lectures on pneumonia, Barr² states that under five years of age the mortality is from 30 to 50 per cent. This seems hardly credible unless the author bases his opinion entirely upon hospital experience. In private practice, even in very young children, no such mortality should occur. The following summary gives what Northrup³ considers the three best signs in obscure beginning pneumonia in infants under two years: 1. Disturbance of pulse-respiration ratio, so that it approximates three to one, thus departing from the normal four to one. 2. Continuous, intermittent or remittent fever. 3. Fine râles

LOBAR PNEUMONIA. In an article on croupous pneumonia J. P. West⁴ states that about one-third of the cases of pneumonia seen in children are of this type. It may occur as a complication, but is usually primary. The perversion of pulse-respiration ratio is an important sign. Crisis occurs in about one-third of the cases. In children under two and a half years the fall is frequently by lysis. In making the examination of a child suspected of pneumonia three things are to be borne in mind: 1. The left lower lobe is most frequently affected, next the right apex, next the right base, and next the left apex. 2. The disease may only be found in the apex or in the axilla, and may not involve a whole lobe. 3. The liver dulness extends to the fifth rib in front, to the seventh on the side, and the ninth on the back, and crying may cause it to extend considerably higher, particularly in the back. The symptoms of pneumonia are so variable that three types have been mentioned: gastric, cerebral, and wandering. Warning is given by West against attempting to do too much in treating croupous pneumonia in children. The mortality of the disease is so low that over-vigorous measures are not required. Mustard pastes may be applied to relieve pain, but poultices should not be used. Expectorants are not needed. Plenty of fresh air is essential. Forced feeding should not be resorted to unless there is a progressive weakness. The best diet is milk with a little whiskey. Brucine, strychnine, digitalis, or whiskey should be administered at signs of failure. During the extreme depression which sometimes follows the crisis small doses of nitroglycerin should be added. Small doses of codein are useful for the pain or troublesome cough. If the temperature be very high an

¹ Practitioner, January, 1900.

² British Medical Journal, June 16, 1900.

³ Medical Age, 1900, vol. xvii., No. 20.

⁴ Cleveland Medical Gazette, January, 1900.

occasional dose of phenacetin may be administered, but this drug should be used with caution.

Some interesting observations are reported by W. M. Fisher¹ upon post-critical temperature of lobar pneumonia in children. It rarely reaches 103° F., and occurs in from thirty-six to forty-eight hours after the crisis. Such temperature has usually been considered as indicative of the extension of the pneumonic process or beginning pleurisy, but the author believes it is often coincident with liquefaction of the consolidated lung. A very peculiar epidemic of a contagious form of pneumonia fever is described by Sir Herman Weber.² Histories are given of seven cases. Crisis occurred usually in four days, and the period of incubation was about twelve days. The lower lobes were chiefly affected.

Empyema. Notwithstanding all that has been written upon empyema in children, it is frequently overlooked and is more common than the average practitioner appreciates. Among 292 surgical cases treated in the babies' wards during 1899, Lloyd³ reports nineteen cases of empyema, placing that disease sixth in point of frequency out of sixty-four distinct diseases, and first in point of frequency among cases calling for immediate operation. In an article upon the pleurisies of children Ausset⁴ deals chiefly with empyema, which in France, he says, is far more common than serous pleurisy. The three most important signs of fluid in the chest in young children, he believes, are exploratory puncture, radioscopy, and the *signe du sou*. The latter is determined as follows: A coin is placed upon the chest of the patient and tapped with another coin; if auscultation be performed at a point opposite one obtains a clear, metallic sound, as though the coin was being tapped close to the ear; but if fluid be present in the pleural cavity the sound is dull and distant and has no metallic resonance.

In an extended article upon the etiology of empyema McFarland⁵ asserts that the condition is always infectious, but not always specific. The micro-organisms found in the pus vary considerably with the time of life at which the empyema occurs. Thus, in children the pneumococcus is most frequently met with, while in adults it is the streptococcus. In adults the number of tuberculous empyemas is nearly twice as great as in children. The observations of Netter are quoted at great length and correspond with the author's own observations. In a study of empyema Bovaird⁶ says that of the 69 fatal cases at the

¹ Philadelphia Medical Journal, September 15, 1900.

² Jacobi Festschrift, 1900.

³ Post-Graduate, February, 1900.

⁴ Annales de Médecine et Chirur. Infantiles, April, 1900.

⁵ Philadelphia Medical Journal, September 15, 1900.

⁶ Medical News, December 23, 1900.

New York Foundling Hospital, 11 occurred in children under six months, 40 in children between six months and a year, and 18 in children between one and two years. He asserts that the mortality during this period is very high. Empyema in infants is very frequently mistaken for pneumonia, for the rational signs are the same as those of pneumonia in children. The physical signs cannot be relied upon for diagnosis. Exploration is called for in every case in which, with the rational signs of pulmonary disease, there is found marked dulness or flatness over any part of the lung, especially if accompanied by diminution or absence of voice and breathing or displacement of the heart. Exploration should be made with a large needle, and repeated if necessary. No case in the Foundling Hospital has ever shown harm from the use of the needle. Practically all pleural effusions in infancy are either purulent from the beginning or soon become so.

The tendency of effusions of the serous membranes to be purulent is especially referred to by Crandall.¹ The fact is also commented upon that primary empyema virtually never occurs in young children. It is most commonly secondary to some other disease, commonly pneumonia. Netter found 53.6 per cent. of empyemas in children presenting pure cultures of the pneumococcus, and 3.6 per cent. presenting pneumococci and streptococci combined. In 17.6 per cent. he found streptococci alone. Many of these latter cases were secondary to streptococcus pneumonias, most of them being due to grippe. A part were secondary to streptococcus diseases of other portions of the body, such as pseudodiphtheria, osteomyelitis, and infected wounds. Tubercle bacilli were found by Netter in but 14.3 per cent. of cases. The great number of empyemas due to some form of pneumonia is thus clearly shown. The signs of fluid in the chest of a small child are too often interpreted as indicative of unresolved lung consolidation, and death results from lack of proper treatment. Many cases of so-called chronic pneumonia are nothing more nor less than empyema. Another point of importance is the criticism which practitioners sometimes receive when a diagnosis of pneumonia has been made and fluid has subsequently been found. It should never be forgotten that an empyema in a young child has probably been preceded by pneumonia.

TREATMENT. Of the various methods of treatment proposed for empyema but three are worthy of consideration: 1. Pneumonic aspiration, which is more effective in affording relief than in effecting a cure. 2. Simple thoracotomy is a rapid method and is most generally in vogue. 3. Operation with exsection of a portion of one or more ribs. It is regarding the necessity of the latter operation that opinions chiefly differ.

¹ International Medical Magazine, October, 1900.

Vaux¹ apparently favors the latter, and refers to the fact that a much different operation may be required for dispensary and hospital cases than for children seen in private practice. He lays down the following judicious rules: Exsect (1) in tubercular cases where secretion will probably go on for some time; (2) in long-standing cases where the pleura is thickened; (3) in some cases of streptococcus infection; (4) when simple incision has been tried and failed. Make a simple pleural incision (1) in all cases in which it is absolutely necessary that shock, however slight, be avoided; (2) whenever time is the first consideration; (3) in empyema of healthy, well-nourished children, where aspiration shows seropurulent fluid only.

The advantages of thoracotomy are these: (1) Rapidity and simplicity; (2) no cancellous bone tissue is opened up; (3) recovery is quicker. If the tube be of soft material it is liable to be compressed between the unyielding ribs; if of a hard substance it plays upon the periosteum, tending to strip it off and induce necrosis. A decided objection to exsection is the osteomyelitis which sometimes follows, owing to the infection of the medulla of the rib by the flow of streptococcic pus over its cut ends. This complication requires another rather serious operation. I² believe that young children, if operation be performed reasonably early, will recover perfectly with very simple technique. It certainly seems inadvisable to perform an extensive operation when a simple one will accomplish equally good results.

DISEASES OF THE CIRCULATORY SYSTEM.

Acquired Heart Disease. Diseases of the heart in children have recently been the subject of several important papers and discussions. Packard³ speaks particularly of the absence of characteristic symptoms and the impossibility of making a diagnosis except by physical examination. Of 56 cases 29 had shortness of breath, 10 palpitation, 9 œdema of the legs, 6 epistaxis, and 3 cough. Œdema was noticed in no child under six years. J. D. Steele,⁴ in discussing the pathology of heart disease, refers to the fact that it may follow diphtheria, scarlet fever and various infectious conditions. In speaking of prognosis A. V. Meigs⁵ affirms that cardiac disease is more hopeful in children than in adults. It may, in fact, disappear in young children. Extreme cardiac enlargement is an unfavorable factor, while the character of the murmurs is of but little importance. Griffith⁶ warns against

¹ Loc. cit.

³ Journal of the American Medical Association, June 23, 1900.

⁵ Ibid.

² Loc. cit.

⁴ Ibid.

⁶ Ibid.

making a diagnosis from murmurs alone. The peculiar position of the heart in childhood should be remembered, and also the fact that an unaccentuated pulmonary second sound is not abnormal. Compensation is so easy in childhood that the absence of symptoms does not prove that cardiac disease is absent.

In an extended paper on heart murmurs in infancy and childhood, Jacobi¹ reports a case of undoubted functional murmur in a baby, aged thirteen months. Organic valvular disease does not necessitate the presence of a murmur and mitral stenosis need have no murmurs at all. Endocarditis does not necessarily mean a valvular lesion. Hence, it is frequently very difficult to detect. Most murmurs, however, mean organic lesions. They are not always audible when the heart is beating rapidly, and hence are sometimes overlooked. Zahorsky² refers to the pulse in childhood, which is frequently irregular even in healthy infants. Anæmic murmurs in early childhood he regards as uncommon.

Forchheimer,³ after a particularly careful study of dilatation of the heart in influenza in children, concludes that we are justified in assuming two kinds of heart dilatation in influenza: one produced by the action of the toxin upon the nervous system of the heart, and possibly upon the myocardium; the second occurring in such conditions in which overflow of the blood is materially interfered with on account of mechanical conditions. The first form undoubtedly may end fatally; the second form is one that lasts much longer than the first, but in children has a tendency to recovery. The normal boundaries of the heart are studied by Troitsky⁴ in a very extensive paper, illustrated by diagrams, without the reproduction of which it is impossible to present a satisfactory summary.

The infrequency of endocarditis in young children is shown by Northrup⁵ by the fact that in over 27,000 infants admitted to the New York Foundling Asylum, with nearly 3000 autopsies, not one case of undoubted endocarditis occurred. Heart murmurs were noted many times, but were either anæmic, ultimately disappeared, or were unexplained by the autopsy findings. Adams⁶ reports a case of septic endocarditis and gives a summary of forty-six cases from the literature in children under fourteen years. The diagnosis must rest largely upon the irregular fever, the changing character of the cardiac murmur, and its tendency to form emboli. There may be few or no symptoms referable directly to the heart, and it may simulate malaria or other septic affections.

¹ Medical News, May 12, 1900.

² New York Medical Journal, February 10, 1900.

⁴ Ibid.

⁵ Ibid.

³ Jacobi Festschrift, 1900.

⁶ Ibid.

TREATMENT. In discussing the treatment of heart disease in children H. A. Hare¹ refers to the fact that children are often entirely free from symptoms and require no treatment. When treatment is necessary, rest is by far the most important measure. It is particularly necessary at about the period of puberty, which is an especially dangerous one for these children. Among drugs, alteratives are the most important, arsenic being particularly valuable. Bichloride of mercury in doses of $\frac{1}{1000}$ to $\frac{1}{300}$ grain is also valuable. Digitalis is commonly used in too large doses, 1 to 2 minims or less being usually sufficient, for it shows its bad effects sooner than in adults. Strychnine is also a seriously abused drug; its temporary good effects are frequently seen, but they are not permanent, and increased doses cause nervous irritability of the heart. Strychnine is a whip to the heart, and not a tonic. Alcohol is rarely necessary. In an editorial article² the same opinions are expressed regarding strychnine and digitalis. It is not affirmed that they have no place in the treatment of heart disease in childhood, but rather that they should not be regarded as first-rate cardiac stimulants to be used during long periods. Strophanthus is a cardiac tonic of greater value than digitalis for children. One or two minims of the tincture given twice or thrice a day for a considerable period will often produce most excellent results.

The importance of prolonged rest in bed after acute cardiac inflammation in children is strenuously urged by Holt.³ There are three reasons why cardiac inflammations are likely to be serious in young children: 1. The frequency with which both the endocardium and pericardium are involved. 2. The great tendency to acute dilatation. 3. The liability of these attacks to be complicated by pneumonia. The cardiac muscle in young children has by no means the resistance which it attains in later life; as a consequence, dilatation comes on readily and progresses more rapidly than in adults. The danger of dilatation is much increased in cases complicated by pericarditis. It is largely owing to rapid dilatation that we see so many cases succumb during acute attacks, and it is usually in consequence of progressive dilatation that cardiac failure, with dropsy and all its attendant features, so often follows within a few months after the primary attack. It is this condition of the heart walls which must be the chief consideration in the treatment of acute attacks, not only during the period of active inflammations, but for a considerable time afterward. Holt has long been of the opinion that if we would minimize the injurious effects of acute endopericarditis we must secure to these patients as nearly absolute rest

¹ Archives of Pediatrics, August, 1900.

² Therapeutic Gazette, June 15, 1900.

³ Archives of Pediatrics, December, 1899.

as is possible ; and that not simply for a period of two or three weeks after acute symptoms, but for as many months.

Congenital Heart Disease. Alfred Hand¹ says that no classification of congenital heart disease is entirely satisfactory, some being too broadly comprehensive, and in others but a detailed enumeration of lesions found. He considers that the principal congenital lesions arise from faults of development and foetal endocarditis. The latter may be caused by disease, such as rheumatism or syphilis in the mother, or it may arise without such disease. The right side is more frequently affected than the left. Heredity is claimed by some to play an important part in producing congenital heart lesions. With reference to anatomical lesions, Holt's summary is given, the order being that of the frequency with which the lesions were present in 242 cases : Defect in the ventricular septum ; defect in the auricular septum or patent foramen ovale ; pulmonary stenosis or atresia ; patent ductus arteriosus ; abnormalities in the origin of the great vessels ; pulmonary insufficiency.

Griffith² gives the symptoms of congenital heart disease as cyanosis, clubbing of the fingers, thrill, characteristic murmurs, and the absence of any great enlargement. The murmurs are loud, rough, and intense, and are heard loudest at the base of the heart and at the aortic and pulmonary cartilages.

DISEASES OF THE GENITO-URINARY SYSTEM.

Nephritis. Several papers have appeared during the past year laying stress upon the fact that nephritis in young children is frequently overlooked and is more common than the average practitioner seems to realize. Freeman³ reports a rare case of nephritis complicating influenza. The disease was of the acute hemorrhagic type. In discussing the subject Fruitnight said that he had seen but one case of albumin in fifty-seven cases of influenza. Dorning had seen three, Jennings one. Brill and Libman⁴ present a contribution to the subject of chronic interstitial nephritis and arthritis in the young. They believe the condition is not so rare as the omission of reference to it in literature would indicate. Moncorvo⁵ writes upon the subject of malarial nephritis, which he believes is not uncommon. It runs a short and usually favorable course. Albuminuria is constant, and hyaline casts are frequently found, while pronounced œdema is sometimes seen. Cheadle⁶

¹ Philadelphia Medical Journal, June 30, 1900.

² Ibid.

³ Archives of Pediatrics, October, 1900.

⁴ Journal of Experimental Medicine, 1900, vol. iv., Nos. 5 and 6.

⁵ Pediatrics, April 15, 1900.

⁶ Lancet, March 31, 1900.

also believes that malaria may cause nephritis in the young, though it is commonly overlooked, owing to its benignity. The kidneys of 220 infants from two to nine months of age were examined at autopsy by Goulkewitch¹ and 23 found to be the seat of nephritis. The primary disease was pneumonia in 11, tuberculosis in 6, and enteritis in 6.

Malignant Tumors of the Bladder. Concetti² has collected from the literature 42 cases of vesical tumor; of these 22 were sarcomata, 10 myxomata, 6 fibromata, and 1 dermoid cyst. The fact that twenty-nine of these patients were under five years points to embryonal origin. Such tumors are usually multiple. The trigonum vesicæ is their chief seat. Without operation vesical tumors, even when benign, are always fatal.

Nocturnal Enuresis. Kauffman³ groups the causes under five heads: 1. Diseases of the bladder and urinary passages. 2. Irritation of the rectum. 3. Excessive secretion of urine. 4. Excessive irritability of the spinal centres. 5. Irritating quality of the urine. The trouble is due, he believes, in most cases to toxic substances derived from faulty digestion and assimilation, and is rarely a bad habit. His plan of treatment consists, as a rule, in giving bromide of potassium, with either tincture of belladonna or hyoseyamus, as a nightly dose. It is well to administer some alkali, such as citrate of potash, to diminish the acidity of the urine. In an article on "Irritable Bladder in Children," Bierhoff asserts his belief that these conditions are rarely pure neuroses, but manifestations of local changes in the urethra or bladder. He believes the disorder in the great majority of cases to be the result of a combination of conditions, the exciting cause being an abnormal increased reflex irritability of the mucous membrane, most marked at the sphincter, and at times of the trigonum vesicæ, or prostatic urethra. He is inclined to consider most of the long list of causes often given as remote causes only. Hypertrophied tonsils, adenoids, eczema, urticaria, and similar conditions are causes only in that they disturb the sleep and tend to keep the child in a semi-conscious condition. The treatment which has given him the greatest satisfaction has been the following: Where the patients are too small to permit of direct local treatment, hot sitz baths, once or twice daily, the appropriate treatment of accessory causes, the restriction of fluids in the evening, combined with a light evening meal. At night the child is laid so that the head is lower than usual. Where local treatment is possible, applications are made through the endoscopic tube directly to the sphincter itself.

Vulvovaginitis. Sheffield⁴ classifies the disease in children as follows: 1. Catarrhal, due to want of cleanliness, or chemical irritation.

¹ *Revue Mensuelle des Mal. de l'Enf.*, July 19, 1900.

² *Archiv de Mal. des Enfants*, vol. iii., No. 3.

³ *Lancet*, June 30, 1900.

⁴ *New York Medical Journal*, August 4, 1900.

2. Traumatic, due to masturbation, mechanical injury, or indecent violence. 3. Parasitic, due to oxyurides, saprophytes, or pathogenic bacteria, especially the gonococcus. No diagnosis should be made without a careful microscopical examination. Upon the detection of gonococci the physician must impress upon the relatives that they are dealing with a highly contagious disease, which is apt to prove of danger, not alone to the child, but to all coming in contact with it. Strict isolation must, therefore, be insisted upon and perfect cleanliness insured. He uses for the arrest of the vaginal discharge protargol solutions in every variety of vaginitis. The strength must be adapted to each indication. In gonorrhœal vaginitis he employs a 2 per cent. solution; in all other forms half this strength. When the vaginal mucous membrane is very sensitive a weaker solution may be employed. The exuding pus is wiped away with absorbent cotton, and by means of a glass syringe a 5 per cent. solution of sodium bicarbonate is slowly and repeatedly injected until the accumulated pus is removed. This is followed by the injection through a small, soft-rubber catheter of the protargol solution, and this is allowed to remain in the vagina about five minutes by bringing the labia closely together.

Phimosis and Circumcision. Upon few subjects in medicine do opinions differ more radically than upon the question of circumcision. The teaching that every child should be circumcised is now less common than it was a few years ago. There are many, however, who still hold that belief, and an equal number who hold a totally opposite view. Opinions differ so widely that it is impossible to say dogmatically what the consensus of opinion is at the present time. That operation is sometimes necessary cannot be doubted; that dilatation is sufficient in many cases is equally true. Le Moyne¹ strongly urges dilatation, believing that mild measures, which offer a prospect of relief, should first be resorted to. In an admirable paper on the application of rational surgical technique to the operation of circumcision Bacon² lays particular stress on free resection of the mucous layers. He holds that an ideally performed circumcision should consist in almost total resection of the mucous layer and a resection of but a limited amount of the cutaneous layer, taking special pains to leave an abundance of the cutaneous tissue in the neighborhood of the frænum. He also emphasizes the importance of proper treatment of the intervening layer of connective tissue. Any redundancy of it should be removed freely, as it is apt otherwise to form an unsightly bunch behind the corona. In passing the sutures it is necessary to avoid catching up any of the connective tissue and

¹ Pennsylvania Medical Journal, June, 1900.

² Philadelphia Medical Journal, June 9, 1900.

including it in the stitches. The skin and mucous membrane should, on the contrary, be drawn together and united over it. He discards all clamps and divides the layers consecutively. Proper adjustment is secured by stitching together the skin and mucous membrane as fast as they are cut, thus giving no opportunity for displacement.

A case of acute orchitis in an infant, eleven weeks old, is reported by Warner.¹ The child had been circumcised, but the wound was healthy and had almost healed. The inguinal glands were not enlarged. The orchitis was on the right side, but a few hours after its onset a hydrocele developed on the left side. The parts on both sides became normal after four weeks.

Sarcoma of the Kidney. Cases of this important condition continue to be reported at frequent intervals. Herzog and Lewis,² in an excellent paper on embryonal renal adenosarcoma, report a case and discuss at considerable length the theories of its formation. They agree in large part with the views of Hirschfeld, but disagree with Wilme and Brosius. They believe that these growths owe their origin to an inclusion which is formed in the following manner: The nephrotome is not cut off at the normal site, but in such a manner that part of the myotome is severed from the main mass and remains in connection with the nephrotome. The separation may take place so that only a part of the myotome proper is cut off, or a part of the sclerotome may likewise be taken along. If the former occurs we have the matrix for striated muscle fibres alone; if the latter occurs we have also the matrix for cartilage. If now we assume that part of the nephrotome (Wolffian body), to which the tissues of the myotome proper, or the latter and the sclerotome, have become adherent by an abnormal process of embryonic separation, becomes included in the permanent kidney, we have a matrix containing all those embryonic elements which occur in the mixed renal tumors, namely, striated muscle fibres, cartilage, other connective tissue elements, and epithelial glandular structures. The latter are derived from the excretory tubules of the nephrotome. This theory accounts for these neoplasms without compelling us to take refuge, as Wilme does, in metaplastic processes unheard of in tumor formation. Cases of renal sarcoma are reported by Morton,³ Lloyd,⁴ and Rehn.⁵

DISEASES OF THE NERVOUS SYSTEM.

The Neuroses of Early Life. The neuroses common to early life have received much attention in recent years. One of the first to trace

¹ British Medical Journal, January 6, 1900.

² American Journal of the Medical Sciences, June, 1900.

³ British Medical Journal, February 3, 1900.

⁴ Post-Graduate, February, 1900.

⁵ Jacobi Festschrift, 1900.

the relationship between these affections was Clouston.¹ He pointed out the fact that the brain differs from nearly every organ in that it requires years to develop its functional activity. It must pass through several well-defined stages of functional development, and various forms of nerve disorder appear as these stages are reached. The expression, "neuroses of development," is, therefore, most appropriate.

Heredity is a predisposing cause in nearly all of these neuroses. In some it is the only cause; in others it can only be considered a predisposing cause more or less remote. While heredity plays a large part in the development of many neurotic disorders of childhood, in most cases other factors are also at work. O. J. Kauffman,² in two thoughtful lectures, studies these various factors. He speaks especially of chorea, salaam spasm, tetany, night-terrors, nocturnal enuresis, migraine and allied conditions, and epilepsy. He concludes that they have the following etiological points in common: They are produced by emotional causes and also by a group of toxic causes, together with which hereditary predisposition has an important influence. Auto-intoxication from the alimentary canal he regards as a factor of the first importance. The gastro-intestinal factors may be enumerated as follows: 1. An excessive amount of food. 2. Food unsuitable either to the age of the patient or his individual digestive capacity. 3. A catarrhal condition of the stomach or small intestine. 4. Constipation is undoubtedly one of the most common predisposing causes of all the neuroses here considered. While agreeing with Kauffman's conclusions regarding the agency of toxic substances in producing many of these neuroses, I would lay more stress upon hereditary or inherent tendency. There is a predisposition in some children which causes such diseases as chorea, night-terrors, and tetany upon the slightest provocation, while other children, with apparently far more infection, show no tendency whatever to such disorders.

TREATMENT. In view of so many common causes in the production of these neuroses their treatment must possess certain common features. Correction of dietary errors is one of the main points requiring attention. In the majority of cases it is advisable to reduce the meat. It is seldom necessary or advisable to remove it altogether from the dietary, for it is nearly always an excessive quantity which leads to the trouble, not a small or moderate amount. In many children the daily quantity of food must be diminished. The prevention of constipation is very important. Tonics are usually indicated, iron and cod-liver oil being most useful. While the general plan of treatment is applicable to all neuroses, each requires some special treatment.

¹ Edinburgh Medical Journal, 1890.

² Lancet, June 30 and July 14, 1900.

The education and general training of these children is very important. They should live as much as possible in the open air. In school they should be restrained rather than crowded forward, restraint rather than urging being advisable in every direction. Order, method, and system should be cultivated, for, says Clouston, "these weakly neurotics are always disorderly, unbusiness-like, and unsystematic."

Chorea. The ultimate cause of chorea is still being sought, but is far from being determined. Marcoli¹ has studied rheumatic chorea bacteriologically in seventeen cases. He believes he found undoubted bacterial infection; in fourteen the prominent germ was a staphylococcus, and in three the diplococcus lanceolatus. Starr² reports observations made upon 1400 cases treated during twelve years in the Vanderbilt Clinic. In but 285 cases was fright considered the cause. Rheumatism was assigned as a cause in only 21 per cent. of the cases. In a previous series of 2000 cases he found rheumatism in 26 per cent. He concludes that to ascertain any definite cause for chorea is most difficult. Like most other neurologists, he finds a less close relationship between chorea and rheumatism than most pediatric practitioners.

John Lindsay Steven³ reports some very accurate observations upon 112 cases of chorea. In 55 out of 81 of these in which the matter was studied, he found no definite history of rheumatism. He believes, however, that the relationship between rheumatism and chorea is much closer than the figures indicate, for well-marked rheumatic symptoms have often followed chorea after a considerable interval. Collins and Abrahamson⁴ analyze 100 cases of chorea with special reference to etiology. They do not regard chorea as infectious in the true sense of the term, but are convinced that a definite relationship exists between it and the rheumatic dyscrasia. It was found that tonsillar rheumatism had occurred in 23 cases, articular rheumatism in 16, and cardiac rheumatism in 32.

Kraft-Ebing⁵ places heredity and individual predisposition as important causative agents. Rheumatism he regards as an important agent as well as abnormalities of the skull. He believes that the disease may be due either to some infectious condition or to strictly nervous origin. Kauffmann⁶ believes that sharp mental impressions sometimes evidently cause chorea, but in the great majority of fright cases the evidence is strong that a predisposition existed. In most cases seen in England evidences of rheumatism sooner or later appear. Brochu⁷

¹ Berl. klin. Woch., April 2, 1900.

² Jacobi Festschrift, 1900

³ Archives of Pediatrics, March, 1900.

⁴ Philadelphia Medical Journal, February 24, 1900.

⁵ Wiener klinische Woch., October 26, 1899.

⁶ Loc. cit.

⁷ Bulletin Medical de Quebec, April, 1900.

after a study of Sydenham's chorea concludes: 1. It increases with age after puberty. 2. It is a neurosis of development. 3. It is often associated with acute rheumatism. 4. In rare cases it follows certain infectious diseases, but more commonly is the result of violent emotions in those having hereditary or degenerative taint. Hallé and Langevin¹ report a fatal case of chorea in a child, ten and one-half years old, an age when a fatal termination is rare. Sepsis appeared to be the cause of death.

TREATMENT. Upon the treatment of chorea nothing new is presented. Kauffmann,² and nearly every other writer of the past year, regards arsenic in full doses as the most effective medicinal agent. Starr³ says arsenic appears to be the drug of greatest value, while antipyrine is next in efficiency. He advises full physiological doses, although he has seen neuritis follow its use in a few cases. Several cases of peripheral neuritis following large doses of arsenic have been reported, notably three by Railton.⁴ In commenting on these cases, H. A. Hare,⁵ in an editorial article, while holding that the nearest approach we have to a specific for chorea is arsenic, points out that the disease can be treated successfully only when this drug is given in full and ascending doses. He draws attention, however, to the possibility of producing neuritis by the enormous doses sometimes advised. Although most men of experience agree that arsenic, iron, antipyrine, the salicylates, trional, and various tonics have an important place in the treatment of chorea, they also agree with Sachs' dictum that milk and rest will do more for most cases of chorea than any other two measures. To this should be added the judicious use of laxatives and attention to the digestive functions.

Head-shaking (spasm nutans) is a functional neurosis of co-ordination, of a harmless nature, affecting young infants and running a short, well-defined clinical course. It is sometimes known as head-nodding and nodding spasm, and is different from eclampsia nutans or the salaam convulsion, which is a form of epileptic seizure with serious cerebral defect. Neither is it the same as the head nodding sometimes seen in adults and idiots. In an admirable paper John Thomson⁶ reports thirty-five cases of head-shaking with nystagmus (the two cardinal symptoms of the disease), and four cases of nystagmus only. More than three-fourths of all published cases have begun between three and twelve months. Defective light in the home seems to be an important if not an essential element in the causation. The disease, in fact, resembles miners' nystagmus. While rickets was present in thirty-

¹ Archives de Méd. des Enfants, Aug., 1900.

² Loc. cit.

³ Loc. cit.

⁴ Medical Chronicle, February, 1900.

⁵ Therapeutic Gazette, April 15, 1900.

⁶ Jacobi Festschrift, 1900.

three of the author's thirty-five cases, he doubts whether the connection between the two is as close as that between rickets and laryngismus and tetany. He believes diet and hygiene more necessary than the administration of bromides. Drugs designed to improve the general health and measures for the relief of constitutional or temporary ailments produce better results.

Tetany. In discussing the neuroses of childhood, Kauffmann¹ devotes particular attention to tetany, which he believes should be considered a symptom, not an independent disease. He lays special stress upon the fact that it is commonly preceded by conditions liable to produce toxic or infective states, and is inclined to believe it due to toxic rather than reflex causes, though the two elements may exist. The most efficient treatment he has found is bromides combined with proper treatment for the catarrh of the respiratory or intestinal tracts. Thiemich² believes the test for galvanic nerve irritability is essential to a diagnosis of latent tetany. This increased excitability of muscles and nerves is sometimes known as Erb's symptom. Trousseau's brachial symptom usually disappears very quickly after the subsidence of the carpal and pedal spasms. Chvostek's symptom, a spasm of the facial muscles after a sharp blow upon the facial nerve, remains some time after the carpo-pedal spasm. Frank Warren³ reports a case of tetany in a boy, three and one-half years old, in which there was no neuro-pathic hereditary tendency nor digestive disturbance. Herbert Fox⁴ reports a case of tetany in a boy, aged thirteen years, due apparently to prolonged exposure to the sun.

Night-terrors. Huber⁵ adopts the classification of Coutts, who divides these cases into two general classes. In the first the disease is considered reflex in character, due to partial asphyxia owing to nasopharyngeal trouble or ill ventilation of the sleeping apartments. These he terms "nightmare" to distinguish them from the second class, "night-terrors." The latter he regards of central origin, the expression of brain disturbance. The two have but one factor in common, the occurrence of fright in the early hours of the night. Nightmare is more common; the attacks may occur several times during the night. The patient is conscious of his surroundings, and recalls the events of the following day. In night-terrors consciousness is lost; the patient has no knowledge of the attacks when he awakes. The paroxysm takes place but once during the night. They are apt to be followed by more serious disturbances, as epilepsy, migraine, hysteria, or insanity. In

¹ Loc. cit.

² *Jahr. für Kinderheilkunde*, February 6, 1900.

³ *Boston Medical and Surgical Journal*, May 3, 1900.

⁴ *British Medical Journal*, November 25, 1900.

⁵ *Pediatrics*, April 1, 1900.

all instances there is an underlying neuropathic state. No one remedy will answer as a routine measure. Tonics are usually indicated, and stimulants of every kind are contraindicated. The evening meal should be light, and the bowels should be regulated. The child should be kindly treated, and never threatened or scolded. Adenoids and enlarged tonsils should be removed. In neuropathic cases bromide renders good service. Kauffmann¹ assigns three causes: 1. Mental and emotional excitement. 2. Pain or visceral uneasiness. 3. Blood states which irritate the nervous system. The largest number he believes are due to a toxæmic state following indigestion. To this cause is usually due "red-dreaming." Correction of the diet does not always stop the night-terrors, for there is frequently an intestinal catarrh left behind sufficient to perpetuate the nervous symptoms.

Day-terrors (*pavor diurnus*). Still² reports three cases of this character, the ages being respectively six and one-half years, three years, and four and one-half years. The symptoms are fairly constant. A nervous child suddenly, without apparent cause, begins to scream and looks terrified. Sometimes he says that an imaginary person is coming after him, or he has some other form of hallucination or delusion. No coaxing or attempts to soothe seem to have any effect. The duration of the attack varies from a few seconds to a quarter of an hour, and their frequency from one in a fortnight to twenty in a day. Although the day attacks may be associated with night-terrors, they may also occur without nocturnal symptoms. The disease is a paroxysmal neurosis doubtless allied to epilepsy. Many of the patients show one or more of the minor functional neuroses, particularly enuresis, recurring headaches, or great excitability. Indigestion and gastro-intestinal irritation are undoubtedly active causes. In the cases seen by Still citrate of potassium was apparently the most effective drug, but bromides either alone or combined with belladonna were also valuable. The prognosis is favorable.

Hysteria. Hysterical manifestations may appear very early in life. De Merritt³ believes that the majority of adult cases of hysteria and neurasthenia have their insidious beginning in childhood. In many cases heredity is a factor. Neurotic parents, being in a constant state of irritability themselves, scold and nag their children, yet have not the will-power to enforce real discipline, thus destroying what little equilibrium their unfortunate offspring may have been born with. Overwork at school, over-mental stimulation, lack of exercise and fresh air all contribute to the same end. The first symptoms are shown by

¹ Loc. cit.

² *Lancet*, February 3, 1900.

³ *New York Medical Journal*, June 16, 1900.

irritability, insomnia, night-terrors, fits of crying, paroxysms of passion, feigning of illness, undue love of sympathy, or the more marked forms of neurosis. Tonics and reconstitutives are usually required, but beyond this drug treatment is very ineffectual. Moral and physical training should occupy a much more prominent place.

A well-defined case of hysteria in a child, aged ten years, is reported by Bourneville and Boyer.¹ The ancestry was bad, but the immediate cause was fright and alcoholism. A case of hysteria with laryngeal manifestations is reported by Herman.² It belonged to the second group in Henoch's classification, which is as follows: 1. Those with marked psychical phenomena, viz., complete or partial unconsciousness, hallucinations, delirium, pavor nocturnus or diurnus. 2. Those with convulsive seizures: singultus, crying or laughing spells, dyspnoea, asthmatic attacks, spasmodic cough. 3. Those with co-ordinated movements, as springing, climbing, and running. 4. The rarest form, those with neuralgic or trophic disturbances.

Hysterical joint affections are rare in children. Alexandrow,³ however, reports three cases in children of seven, eleven, and thirteen years respectively. Porter⁴ also reports a case of hysterical hip-joint in a girl, aged eleven years.

Meningitis. The history of spinal meningitis in Ireland from the time it was first observed, in 1846, is reviewed by Drury.⁵ Parsons⁶ reports seven cases seen in hospital practice in which Kernig's sign was found, in some as early as the third day. This sign has been the subject of a number of reports. Kernig described the condition in 1884, in which, even when there is no flexion of the joints while lying down, complete extension of the leg on the thigh with the patient in the sitting position becomes impossible. Among fifteen patients he found the sign always present. Packard⁷ found the sign present in 90 per cent. of forty-six cases of meningitis. He reports three cases in infants, aged respectively sixteen, sixteen, and four months. All were proved by autopsy to have been meningitis, but in all this sign was absent during life. However, he would not be considered as belittling the value of Kernig's sign. It is of undoubted value in adults and older children. Barr⁸ has seen over-action of the flexors in the upper as well as the lower extremities in patients having no spinal disease.

LUMBAR PUNCTURE is still the subject of discussion. Certain author-

¹ *Le Progrès médicale*, April 21, 1900. ² *Archives of Pediatrics*, September, 1900.

³ *Archiv für Kinderheilkunde*, B. xxviii., II. 6.

⁴ *Journal of the American Medical Association*, May 19, 1900.

⁵ *Dublin Journal of Medical Science*, July, 1900.

⁶ *Ibid.*

⁷ *Archives of Pediatrics*, April, 1900.

⁸ *British Medical Journal*, March 14, 1900.

ities have reported negative results, while others have explained such negative results as due to imperfect technique. Northrup¹ reports an experience of thirty cases, together with twenty others with which he has been in touch. In none did he see any ill effects. Connor² regards the accidents as unimportant and trifling. Caillé³ regards the operation as of considerable value from the diagnostic standpoint, and regards it as justifiable. As a therapeutic measure he agrees with most other observers that it is ineffectual.⁴ Barr considers that with a positive result lumbar puncture establishes the diagnosis, but in many cases of even purulent meningitis the fluid is perfectly clear and free from pus organisms. Gumprecht⁵ does not regard the measure as free from danger. He reports two cases of death in his own experience, though the relationship between the operation and the death which occurred a few hours later does not appear. He finds fifteen cases of sudden death reported in literature as following lumbar puncture. A very complete critical summary of the literature of lumbar puncture is given by Hand. As a result of his study, he concludes: 1. Lumbar puncture has a wider field as a diagnostic aid than as a therapeutic means. 2. As an aid to diagnosis, lumbar puncture is of value only when examination of the fluid gives positive results; it is not safe to draw conclusions from negative results. 3. Therapeutically it is of value in epidemic cerebro-spinal meningitis to bring about recovery, in tubercular meningitis to promote comfort, and in other conditions of excessive pressure to favor recovery by removing a condition immediately dangerous to life.

The somewhat uncommon circumstance of cerebro-spinal meningitis complicating measles is reported by England.⁶ No autopsy was obtained, but secretion taken from the nose gave a pure culture of diplococci. Nobencourt and Del Estre⁷ report two cases of bronchopneumonia which terminated fatally with cerebral symptoms. In one of these at the autopsy acute, serous, cerebral meningitis was found; and in the other cerebro-spinal meningitis of seropurulent nature. In both streptococci were found. It seems clear that the micro-organism produced a serous inflammation in one case and a seropurulent one in the other, for which no feasible explanation is given.

Hydrocephalus. The treatment of hydrocephalus by craniectomy was discussed at the last meeting of the American Pediatric Society. Davis⁸ reported the case of a six-months-old infant in which the cranium was trephined under antiseptic precautions, through the parietal bone

¹ Archives of Pediatrics, August, 1900.

² Ibid.

³ Ibid.

⁴ Loc. cit.

⁵ Deutsche med. Woch., June 14, 1900.

⁶ Montreal Med. Journal, Dec., 1899.

⁷ Annales de Méd. et Chirur. Infantiles, April 15, 1900.

⁸ Archives of Pediatrics, July, 1900.

of the right side. A sterilized silver canula containing a stilette was then passed through a slit in the membranes until the ventricle was reached, when the stilette was withdrawn. A stream of serous fluid followed. The child died a few hours after the operation. Although the literature does not lead one to hope for permanent recovery, such an operation seems to offer more than any other known method of treatment. In discussing the subject, Rotch¹ said that many operations of this kind had been performed in the Infants' Hospital at Boston. In some cases the drainage was maintained for several weeks. The result was always bad, and the operation could be considered in no way curative. Dorning referred to a case in which he had withdrawn two ounces of fluid by lumbar puncture. The child improved for three weeks, and the convulsions ceased. Koplik reported three cases in which the ventricle was aspirated, and one case treated by lumbar puncture. The symptoms, particularly convulsions, were relieved, but otherwise the treatment seemed to be unavailing. The shape of the skull in hydrocephalus is considered by Regnault.² The brachycephalic is the most common form, partly disappearing in adult life, but never entirely. This form of skull has two modifications in hydrocephalus : 1. Prominence of the parietal, frontal, and occipital bosses. 2. Asymmetry of the cranium, resulting from pressure and position of the child's head during sleep.

Cretinism. In an extended discussion upon the differential diagnosis between cretinism and Mongolism, Sutherland³ mentions the following symptoms as characteristic of cretinism : Symptoms are seldom present before the sixth month ; the patient is dull and passive, the face expressionless ; active movements are absent ; the skin is swollen, dry, and scaly, the hair scanty and coarse ; in the neck are fatty deposits ; the palpebral fissure is rendered small by swelling of the eyelids ; the epicanthus is absent ; the tongue is swollen and protruding ; the lips are thick ; the size of the fingers is normal ; the thyroid is absent or atrophied. The symptoms of Mongolism are present at birth ; the patient is smiling, observant, and imitative ; skin and hair are normal ; there are no fatty deposits ; the palpebral fissure, while small, is obliquely placed ; the epicanthus is distinct, and the lids are not swollen ; the tongue sometimes protrudes, but is not swollen ; the lips are mobile.

TREATMENT. The chief interest of recent articles upon cretinism lies in the treatment. Five cases are reported by Freeman, Herman, and Noyes.⁴ One of Freeman's patients received at first small doses of

¹ Archives of Pediatrics, July, 1900.

² Revue Mensuelle des Mal. des l'Enf., June, 1900.

³ Lancet, January 6, 1900.

⁴ Archives of Pediatrics, August, 1900.

thyroid, increased up to two grains. In fifteen days she lost 8.5 ounces, but gained 0.5 inches in length. In eight days the constipation was cured. Marked improvement of intelligence was evident in fifteen days, and an entire change of appearance in forty-seven days. Morse¹ reports two cases. The first, a baby, aged six months, received one-quarter grain of thyroid extract twice a day, which was increased to three times a day, upon which doses improvement was marked. In the second case the appetite failed under the thyroid treatment, and it was discontinued. Graham² reports the case of a girl, aged six years, in which the initial dose was one-half grain three times a day, which was increased to one grain. Nicholson³ reports the case of a cretin, aged two years and eight months, in whom the effect of thyroid treatment was remarkably rapid and complete. The doses varied from one and one-quarter grains of thyroid powder to two and one-half grains given once daily. Palmer⁴ thinks it probable that if the treatment were begun at the outset of the disease, and before the development of the child had been seriously interfered with, it would develop normally and be free of symptoms as long as the thyroid treatment was continued.

Epidemic Paralysis in children has been reported in recent years by a number of observers. It has generally been considered to be anterior poliomyelitis. Chapin⁵ reports an epidemic which occurred at Poughkeepsie in the summer of 1899, in which he saw seven of the cases. The peculiarity of the epidemic was the existence of severe pain in the paralyzed members. The great majority of all the cases recovered completely in from one to four months. A few cases, however, were left with paralysis and atrophy with the clinical appearances of poliomyelitis. From all the data Chapin believes that these were cases of peripheral neuritis, and were of infectious nature, the infective principle attacking the anterior horns in some cases and the peripheral nerves in others, both being attacked, perhaps, in a few.

DISEASES DUE TO FAULTY NUTRITION.

Scurvy. An experimental inquiry into scurvy is reported by Jackson and Harley.⁶ It is based upon the experience of Nansen and other Arctic explorers, and upon experiments made upon monkeys fed upon boiled rice, maize, and tinned beef. No reference is made to infantile scurvy, and the authors fail to gain some valuable hints which might have been obtained by a study of the disease as it appears during early

¹ *Annals of Gynecology and Pediatrics*, September, 1900.

² *Pediatrics*, March 15, 1900.

³ *Archives of Pediatrics*, June, 1900.

⁴ *American Journal of the Medical Sciences*, April, 1900.

⁵ *Archives of Pediatrics*, November, 1900.

⁶ *Lancet*, April 29, 1900.

life. They reach the conclusion that fresh vegetables and lime juice are not alone sufficient for the prevention or cure of scurvy. They believe that the ptomaines derived from tainted animal food are potent factors in its production.

It is suggested by Home¹ that scurvy is essentially due to an infection of the mouth with micro-organisms which are antagonized by lime-juice and fresh vegetables. Cases are reported by Carr² and Ginbert³ in which recovery was unusually rapid.

A series of blood examinations is reported by Wright.⁴ He concludes that scurvy supervenes upon the ingestion of an excess of mineral acid over bases. In other words, it is an acid intoxication, and, as a deduction, the treatment should consist in the administration of salts of oxidizable organic acids. The use of sodium lactate was followed by an increase of the alkalinity of the blood and improved condition of the patient. Deficiency of citric acid is believed by Corlette⁵ to be the cause of scurvy. It is clear that further study is required before the etiology of scurvy can be considered as settled.

Rickets is undoubtedly increasing in frequency in this country, and is, therefore, becoming a disease of increasing importance. Morse⁶ found evidence of rickets in 80 per cent. of 400 consecutive infants examined in the Infants' Hospital of Boston. He regards it as a chronic disease of nutrition. The earliest symptoms are fretfulness, languor, restlessness at night, kicking off of the bedclothes, sweating of the head, boring the head into the pillow, rolling the head, and night-terrors. Gastro-enteric disturbances, if persistent, are always suggestive. Delayed dentition and delayed development of any sort are more often due to rickets than to any other cause. The diet which seems most likely to produce the disease is one high in carbohydrates and low in fat and proteids. The most important factor, however, seems to be deficiency in fat; the disease seems more likely to develop when the proteids as well as the fats are low. The pathogenesis of rickets is the subject of an excellent paper by Monti,⁷ who asserts that a diet which causes dyspepsia marked by a decrease of hydrochloric acid and an increase of lactic acid is apparently active in causing rickets.

The various theories which have been proposed as to the underlying cause of rickets are well summarized by Tuttle:⁸ 1. The so-called mineral theory, advocated by Virchow and Jenner. 2. The acid theory, championed by Foueray. 3. The vaso-nervous theory of Mayor,

¹ Lancet, August 28, 1900.

³ Pediatrics, September 1, 1900.

⁵ British Medical Journal, September 1, 1900.

⁶ Philadelphia Medical Journal, May 26, 1900.

⁷ Jacobi Festschrift, 1900.

² Medical News, January 15, 1900.

⁴ Lancet, August 28, 1900.

⁸ Pediatrics, March, 1900.

reiterated by Hoffmann and Allen, and later by Perry. 4. The microbial theory. 5. The most plausible is the so-called inflammatory theory. This maintains that the cause is primarily an inflammatory condition beginning in the bone-forming tissues, and has to-day the most authoritative indorsement. Saushin¹ has made a study of the condition of the spleen, and reaches the following conclusions: 1. Rickets is accompanied by definite changes in the spleen, which correspond in intensity to the changes in the bones; rickets appears at an early age, and the traces remain a long time. 2. The hæmatopoietic function of the spleen is evidently weakened by these changes.

It was years ago demonstrated that the presence of lime in the food had no effect upon the production of rickets. The truth of this has been again demonstrated by Stoeltzner,² who shows that both the tissues and fluids of rhachitic infants contain as large an amount of lime salts as do those of the normal child. Non-calcification of the bony structure is, therefore, not due to lack of lime, but rather to some peculiarity of the tissues themselves. Furthermore, depriving young animals of the salts of the alkaline earths produces osseous changes entirely different from those of rickets.

TREATMENT. The most successful treatment of rickets is based upon the etiology as it is now understood. Such treatment is admirably outlined by Morse.³ The diet should be low in carbohydrates and high in fats and proteids. The high fats are especially important. The best form of fat is that found in milk. When the digestion will bear it cod-liver oil should also be given. The child should get the highest possible amount of fresh air and sunshine, and for this purpose the seashore is preferable to the country. Salt baths, massage, and rubbing are useful. There is no specific for rickets, although phosphorus has been claimed to be one. Personally, the author has seen no favorable results from its use. The dose should be $\frac{1}{120}$ to $\frac{1}{100}$ of a grain three times a day after food, given in the form of officinal phosphorated oil (1 minim contains $\frac{1}{15}$ grain) mixed with cod-liver oil or almond oil, or in the form of Thomson's solution. The lime salts and the hypophosphites are useless, except as tonics. The anemia is best treated by iron. Kassowitz⁴ still writes enthusiastically regarding phosphorus, but it is a significant fact that he recommends it dissolved in cod-liver oil. Experienced authorities differ as to its effect. Many have found it beneficial, notably Jacobi.⁵ Others have been unable to satisfy themselves that it has any controlling influence upon the

¹ Jahrb. für Kinderheilkunde, March, 1900.

² Ibid., February 6, 1900.

³ Loc. cit.

⁴ Therap. Monats., April, 1900.

⁵ Therapeutics of Infancy and Childhood, p. 142.

course of the disease, notably Holt,¹ Rotch,² and Morse.³ The use of the suprarenal capsule is highly spoken of by Stoeltzner,⁴ but it seems clear that it has not yet been sufficiently tested to speak with certainty regarding its results. The same author has also used thymus extract in six cases apparently with but little beneficial result.

Foetal rickets is a subject of considerable interest. It has been studied systematically by Fede and Cacace,⁵ who examined with great care 500 new-born infants, and were able to find but one case showing unmistakable signs of rickets and four with doubtful signs. A case is reported by F. Schmey.⁶

A case of late rickets is reported by Little.⁷ The patient was a girl, aged seventeen years, and was apparently healthy until the age of twelve.

GENERAL DISEASES.

Diabetes. After a study of this disease, Chapin⁸ concludes that it is extremely rare in young children, but when it does occur it is exceedingly fatal and is marked by very rapid emaciation. He reports two cases—one patient being four years old and one six. Both died in about three weeks after the disease was discovered.

Arthritis Deformans and Allied Affections. Diseases of this character occasionally occur in early life and present many points of difficulty in diagnosis. Several cases have been reported during the past year. In 1896, Koplik found that eighteen cases of true arthritis deformans had been reported. Taylor and McKim,⁹ in an important article on this subject, classify the diseases marked by chronic bony changes into six classes: 1. Rheumatoid arthritis. 2. Chronic fibrous rheumatism. 3. Arthritis deformans. 4. Osteitis deformans of Paget. 5. Heberden's nodosities. 6. Partial or monoarticular deformans.

Rheumatoid arthritis occurs before the second dentition and attacks the periarticular tendon sheaths, capsules, and synovial membranes. It is usually bilateral. It rarely exhibits any abnormality in the bones or cartilages, and has, further, as a distinguishing feature, the enlargement of the lymphatic glands and spleen. The onset is usually gradual in one or more joints, which slowly become enlarged, and the adjacent muscles undergo atrophy. Generally the order in which the joints

¹ Diseases of Infancy and Childhood, p. 235.

Pediatrics, by T. M. Rotch, p. 1075.

³ Loc. cit.

⁴ Loc. cit.

⁵ Pediatrics, February, 1900.

⁶ Der Kinderartz, March, 1900.

⁷ Medical Press and Circular, May 23, 1900.

⁸ Journal of the American Medical Association, September 15, 1900.

⁹ Archives of Pediatrics, November, 1899.

become affected is: Knees, wrists, cervical spine, ankles, elbows, and fingers. The swelling is smooth and fusiform, and does not exhibit the bony irregularity of arthritis deformans. Grating is never felt, but often creaking is observed and fibrous adhesions. There is usually flexion, and always some limitation of motion. Stiffness does not decrease as the day advances and the joints are used. No redness, joint-heat, nor tenderness on pressure is present. There is pain on active movement, especially when forced hyperextension is attempted. With passive movement usually the pain is slight or absent. "Night-cries" are by no means rare during the active stage. One of the characteristic features is the eventual involvement of the cervical spine with limitation of motion of the head. The eyeballs show in some cases a slight exophthalmos.

Chronic fibrous rheumatism is a sequela of repeated attacks of acute rheumatism. In long-standing cases the cartilages undergo erosion, and the capsules and ligaments of the joints are thickened. There is muscular atrophy, stiffness, and pain. There are often valvular lesions, but no enlargement of the lymphatic glands or spleen.

Arthritis deformans of Charcot is a general progressive disease seen commonly in the aged, but sometimes occurring in children. It begins in the synovial membranes and cartilages, and causes false ankylosis. The shape of the joints is entirely changed. Atrophy is present, and pain may be intense for years. Contractions are frequent. In many cases after two or three joints are involved the disease becomes arrested. The majority of cases reach a quiescent stage. Cardiac as well as glandular symptoms are absent.

Osteitis deformans of Paget consists chiefly in the softening and thickening of the shafts of the long bones of the lower extremities, and marked kyphosis and shortening of the spine, with huge thickening of the vault of the cranium.

Heberden's nodosities show hard tubercles on the distal or second phalanges of the fingers. The joints are red, tender, and swollen, the cartilages may become soft, and the ends of the bones eburnated.

Three cases of rheumatoid arthritis are reported by Lachmanski,¹ one being a girl, aged ten years, one a boy, aged eight, and the third a girl, aged eight. Johannessen² reports three cases of chronic fibrous rheumatism in children, aged seven, five, and ten years respectively. Taylor³ reports a case of arthritis deformans in a boy, aged nine years.

¹ Archiv für Kinderheilkunde, B. xxviii. S. 104.

² Medical Review, vol. iii., No. 18.

³ Pediatrics, February 15, 1900.

DISEASES OF THE BLOOD, LYMPH NODES, AND BONES.

Diseases of the Blood in Children. After reviewing the various theories of etiology of chlorosis, Stengel¹ concludes that after all the evidence has been weighed no definite statement can be made. It is quite certain, however, that chlorosis is common in some families, and that tuberculosis is quite frequent in the same families. He reports cases which show that in the diagnosis of chlorosis the examination of the blood does not alone suffice. We must take into consideration the history and clinical course of the case. We should be especially careful in pronouncing cases with unusual and atypical symptoms chlorotic.

Numerous cases of the various diseases of the blood have been reported. Miller² reports a case of acute leukæmia in an infant, aged eight months. Morse³ reports a case of splenic anæmia in a boy, aged seven years. He remarks that anæmia with enlargement of the spleen with or without leucocytosis is not common in infancy. It is seen especially in rachitic children. The splenic tumor seems to have no special diagnostic significance, as great enlargement of the spleen is often found where there is but little anæmia, and great anæmia where there is but little enlargement of the spleen. The splenic tumor and anæmia seem independent of each other, and are both the results of some common cause. In infancy the common cause is apparently always some profound, complicated, and obscure disturbance of the nutrition. Taylor⁴ reports a case of Hodgkin's disease in a boy, aged seven years. The glands of the neck and axilla were very large, and in the left epitrochlear region there was a huge gland, at least three inches long, and another of about half the size. In the corresponding region in the right arm there were three masses about the size of olives, and here and there about the lower surface of the abdomen were several glands of considerable size. The spleen was only moderately enlarged. The boy was pallid, and had been growing slowly weaker for three or four months. The termination was not known. Begin-sky⁵ records a case of medullary or myelogenous leukæmia in a boy, aged nine years. Treatment was without apparent effect.

A peculiar form of anæmia is described by MacGregor,⁶ of which he has seen twenty-three cases in children between three and sixteen years. There is a peculiar adenitis in which the glands are small and hard and appear in the neck and groins. The spleen is usually enlarged.

¹ University Medical Magazine, April, 1900.

² Archives of Pediatrics, September, 1900.

³ Boston Medical and Surgical Journal, April 26, 1900.

⁴ Pediatrics, February 15, 1900.

⁵ Jacobi Festschrift, 1900.

⁶ Lancet, September 9, 1900.

Anemia is distinct, but not excessive. The leucocytes are largely increased, especially the large uninuclear forms. The disease is chronic, but recovery is the rule. Iron, arsenic, and cod-liver oil are the best remedies.

Cervical Adenitis. Twenty cases of cervical adenitis were studied by Lloyd,¹ with especial reference to etiology. These observations confirm those already made by others: that cervical adenitis in infants is much less often tubercular than was formerly supposed. The infection is more often pyogenic. All cases are not cases for operation. Only after it is proved that degeneration of the glands has begun and the child is not improving under general treatment should operation be resorted to.

Primary Splenomegaly. Under this title Bovaird² presents a most admirable paper. He reports two cases studied with great elaboration. He believes the disease was not splenic anemia, which a superficial observation would suggest, but rather the affection first described by Gaucher as primary splenomegaly. He agrees with Gaucher in regarding it as a definite and distinct disease. Brill has reported two similar cases in adults, not published at the time of this writing.

Osteomyelitis. Rotch³ reports a fatal case of osteomyelitis of the left arm in an infant one month old, and agrees with Nichols in the following conclusions regarding acute infectious osteomyelitis: 1. It is an acute inflammation of the bone due to any one of a number of pathogenic organisms. 2. The staphylococcus pyogenes aureus is the organism most frequently found. 3. An early period of development and the exanthemata predispose to it. 4. It generally attacks the shaft of the bone. 5. The process may attack the epiphysis and extend to the joint.

THE PRACTICE OF SURGERY AMONG CHILDREN.

While the number of surgical diseases which occur solely among children is not large, some occur much more frequently in children than in adults, and still others are common to all ages, but present a totally different aspect during early life. The peculiarities of surgical practice among children is the subject of an excellent paper by Franz Torek.⁴ He does not believe that the surgery of childhood can strictly be considered as occupying the place of a specialty. Nevertheless, from the

¹ The Post-Graduate, February, 1900.

² American Journal of the Medical Sciences, October, 1900.

³ Archives of Pediatrics, December, 1899.

⁴ The Post-Graduate, February, 1900.

fact that a number of surgical diseases differ at different ages, and, furthermore, that there are a number of congenital ailments, the subject certainly deserves special consideration in the study of surgery in the same degree that medical diseases of children are worthy of a special place in the study of medicine.

There are two fundamental differences between children and adults : 1. A difference in their anatomical structure. 2. A difference of metabolic changes necessary for growth. Corresponding to these fundamental differences many diseases, both surgical and medical, present a different aspect in childhood and adult life. The child is in many respects incompletely developed. The skin is extremely tender, the fatty layer comparatively thick, the muscles weak, the bones soft, pliable, and largely cartilaginous. The tenderness of the skin renders it more vulnerable, and were it not for the copious supply of adipose tissue which serves as a cushion and deadens blows and other injuries, it would be injured even more frequently than it is. The muscles are less resistant—a fact which must be remembered in applying bandages, inasmuch as a bandage which has been applied too tightly may easily produce gangrene by pressure.

The difference in the structure of the bones is of the very highest importance. Their pliability determines the fact that traumatism to the bones of children results in lesions which differ from those of adults. The incomplete, green-stick fractures are much more frequent in children than in adults. Fractures through the junction of epiphysis and diaphysis, which occur almost exclusively prior to complete development, owe their seat to the structure, which characterizes developing bone. The periosteum is comparatively thicker than in the adult, and is more loosely attached to the bone. The ligaments of the joints in children are comparatively stronger than those of adults, hence the rarity of dislocations and the more frequent occurrence of separation of an epiphysis by a traumatism, which in an adult would produce a dislocation.

The second fundamental difference between adults and children is a difference in the metabolic changes that are required by the process of growth. There is a heightened cell activity, dependent upon the proper nutrition of the child. On account of this great cell activity a well-nourished child is a more favorable subject for primary healing of solutions of continuity. Acute infections or infected lesions of the skin are not so likely, as in adults, to be followed by phlegmons, septicæmia, and pyæmia. These are apt to be seen only in poorly nourished children. There are also certain chronic infections, particularly tuberculosis, which are much better borne and more easily treated in children than in adults.

While a well nourished child bears infections comparatively well, the reverse is the case in atrophic conditions. An atrophic child will easily develop multiple abscess as the result of infection ; lesions infected with the tubercle bacillus readily produce tuberculous infection of the neighboring glands. Where cell activity has been reduced to a minimum, as in cases of marasmus, the little patient rapidly becomes a prey to wound infection. If there is infection with erysipelas, it will spread rapidly over the entire body, causing the patient's death. A slight cellulitis will become an extended phlegmon, at times with extensive gangrene of the subcutaneous connective tissue. In a few words, then, according to the state of the child's nutrition, there is great diversity in resistance to infections. Well-nourished children resist them better than adults, while poorly-nourished children do not resist them so well as adults.

Anæsthesia in Children. With reference to the important subject of anæsthesia, Torek says that the administration of chloroform or ether is conducted in the same manner as in adults, but it is important for the narcotizer to remember that the quantity to be given must be in proportion to the size and weight of the child, as in the case of any other poisonous drug. If the anæsthetic be chloroform great care must be taken to insure an equality in the depth of the narcosis throughout its administration. The child should not be narcotized deeply at one time, and be half awake at another. Chloroform should be given, drop by drop, continuously, not fitfully, as it is so often done, by pouring a large overpowering dose on the mask and then stopping completely till the effect has worn off. The golden rule in administering chloroform is to give it slowly and continuously, and it is more important in children than in adults. Local anæsthesia, by the injection of cocaine or eucain solutions, has not as wide a range of applicability as in adults. It is to be employed whenever the physical development of the patient is sufficiently advanced to submit to some reasoning upon the subject.

Details of Operating. Torek calls particular attention to the necessity of avoiding chilling the patient and of occupying the least possible time. Both of these points he regards of the utmost importance. He also speaks of the result of hemorrhage during early life. The loss of blood has rightfully been considered one of the greatest dangers in operating upon infants. The loss of two ounces of blood, which may be immaterial for an adult, would either kill a nursing infant or cause a condition of severe anæmia that may last a very long time and interfere markedly with the child's development. Yet it is unfair to compare the actual loss of blood in operations on infants and adults. The relative amounts should be compared, and, if that is done, the disparity does not appear so great. It is stated by many that children bear the shock of operations badly. Whether this is one of the statements that

is handed down from one to another and repeated religiously, though thoughtlessly, or whether operators mistake the effect of hemorrhage or other evil influences for shock, or whether their experience happens to differ from Torek's, he alleges that it is his experience that children stand the shock of an operation not only as well but even better than adults.

Application of Bandages. A warning is given regarding the application of bandages, the improper application of which has so often proved so disastrous. To apply a well-fitting bandage to a child is by no means an easy matter. While on one hand the weak muscles and compressible tissues will not permit of very tight bandaging, on the other hand the child's disposition will usually prompt him to toss about and loosen his bandage. We must, therefore, apply rather large bandages covering a considerable portion of the body beyond the wound to be dressed, and must apply our bandage according to all the rules of the art. A plaster-of-Paris splint is often indicated in children, where in an adult it is unnecessary, simply to be sure that the operated part is kept at rest. A plaster bandage put on for such purpose should not be heavy. It should be thin enough to be easily removable by the scissors. It must be properly padded and frequently inspected. If adhesive plaster is employed on children, the zinc rubber plaster is preferable to the ordinary rubber adhesive plaster, because less irritating to the skin.

PATHOLOGY.

BY LUDVIG HEKTOEN, M.D.

DURING the past year great activity has been evident in this country in pathological work, and several associations have been formed with the object of furthering the interests in pathology and cognate lines. The Society of American Bacteriologists has been organized and meets in conjunction with the American Naturalists. The Section of Bacteriology and Chemistry of the American Public Health Association is doing efficient work in its sphere. At its meeting at Atlantic City in June, 1900, the American Medical Association established a Section on Pathology, and arranged for an annual Pathological Exhibit under the supervision of the new section. The meeting in Atlantic City of the provisional section in pathology was encouraging, and the unofficial pathological exhibit secured through the efforts of Dr. F. B. Wynn, of Indianapolis, was found highly instructive.

The publication of the three memorial volumes—*The Pepper Memorial Volume*, *The Jacobi Festschrift*, and *Contributions to the Science of Medicine by the Pupils of William H. Welch in Commemoration of the Twenty-fifth Anniversary of His Doctorate*—is also notable. The contents of these volumes speak highly for the productiveness and originality of American pathology.

CYTOTOXINS AND ANTICYTOTOXINS.

Few biological problems are of greater practical importance than those of immunity, natural and acquired. In the earlier explanations of the various phenomena of immunity theory had free rein. The recent study of serum pathology has brought into view a series of remarkable activities of whose existence pure morphology, even with its great wealth of observations, could give no indications.

Cellular poisons of animal origin may be natural or artificial—*i. e.*, produced by experiment. Of the latter group there are several; those affecting the blood-corpuscles have been studied the most. One of the latest developments in pathology is the discovery of cytotoxins of animal origin produced by the injection of an animal with various cells of another animal of different species.

Hæmolysins. The effects of the blood of an animal upon the red corpuscles of animals of a different species are of great interest because of the complete analogy presented to the processes of bacterial solution, agglutination and immunization. The discovery of natural poisons for the red corpuscles dates back some twenty-five years to the days of heterologous blood transfusion. Artificial cytotoxins of animal origin are of much later date. In 1898 Belfanti and Carbone¹ for the first time showed that the serum of one animal injected with the blood of another animal of different species becomes toxic for the animal whose blood is injected. The serum of horses previously treated with the blood of rabbits kills rabbits on subcutaneous injection, the red corpuscles of the blood being dissolved. A little later Bordet found that the serum of rabbits treated with the blood of guinea-pigs dissolves the blood-corpuscles of the guinea-pig when the two are mixed outside of the body. Since then numerous communications have appeared concerning the action of hæmolytic (globulolytic) substances and other cellular poisons produced in a similar manner. The various investigators are in harmony concerning the main facts and principal deductions. I shall give a brief statement of the principal results of the experiments in this interesting field, and refer in passing to theoretical and other deductions.

Bordet² showed that the serum of one animal injected with heterologous blood acts on the red blood-corpuscles of the second animal in nearly the same manner as the serum of an animal vaccinated against cholera acts on the cholera vibrios, the corpuscles being agglutinated and the hæmoglobin dissolved. Ehrlich and Morgenroth³ then studied the phenomena which follow injection of goats with the whole blood of sheep. They found that the goat's serum acquires the power to dissolve the corpuscles of the sheep. It should be stated that slight agglutinating and solvent powers are normally but not constantly present in the goat's serum. The treatment with sheep's blood—peritoneal injections—greatly increases and accelerates these effects. Von Dungern⁴ found that when chicken's or pigeon's blood is injected into the peritoneal cavity of guinea-pigs the corpuscles of the injected blood were slowly dissolved. Repeating the injection two weeks later the corpuscles dissolved more speedily, and the serum of the guinea-pig now promptly agglutinated and dissolved the corpuscles outside as well as inside the body. This solvent action was found quite specific for corpuscles of the animal whose blood was injected, but not absolutely so.

¹ *Giornale d. R. Acad. di Med. di Torino*, 1898.

² *Ann. de l'Inst. Pasteur*, 1899, xiii., 273-297.

³ *Berl. klin. Wochenschr.*, January 2, 1899, xxxvi., 6-9.

⁴ *Münch. med. Wochenschr.*, March 28, 1899, xvi., 405-407.

Ehrlich and Morgenroth¹ injected large quantities of goat's blood into the abdominal cavity of a second goat. A lysin formed that readily dissolved the corpuscles in the blood of a number of other goats, some, however, being refractory. They call this lysin isolysin in distinction to heterolysin, which develops on injection of blood from another species. Autolysin—*i. e.*, substances destroying the cells of the animal in which they develop—could not be produced. There are a number of pathological conditions associated with the absorption of cells in which autolysins might be expected to form, as after hemorrhage, in acute yellow atrophy of the liver, lymphatic tumors, goitre, etc. But that autolysins form under these conditions has not been demonstrated. Ehrlich and Morgenroth regard this as due to the absence of specific molecular chains, or receptors, in the cells. What might happen when "internal regulating processes" are disturbed is a deep problem.

Landsteiner has shown that human blood may contain isoagglutinins, especially in chlorosis. And Halban² calls attention to the possibility that isoagglutinins and isolysins may arise in the maternal and foetal bloods as the results of a reciprocal immunization during gestation.

There are also certain natural poisons for red blood-corpuscles. Thus the serums of many animals are naturally toxic—that is, contain hæmolytic substances. These properties have been studied by Kossel, Camus and Gley, Tchistovitch,³ Stephens and Myers, Stephens,⁴ and others. Eel's serum is strongly toxic for the blood disks of rabbits and many other animals. By repeated vaccination—*i. e.*, injections in increasing doses of eel's blood—the rabbit's blood acquires antitoxic powers that protect its corpuscles against the action of eel serum. Cobra poison and other venoms are also strongly hæmolytic, and anti-venoms suspend their hæmolytic action (Myers). It is well to note that the hæmolytic substances in the different serums and snake venoms are not identical.

Camus and Gley⁵ have demonstrated that in certain animals (hedgehogs, birds, etc.) the corpuscles withstand the eel's serum not by virtue of anti-hæmolytic substances, but rather because of what they term a special cellular organization—a cellular immunity in contradistinction to acquired or humoral immunity due to antitoxin. New-born rabbits present a transitory cellular immunity of this kind. They also show that natural cellular immunity and acquired antitoxin immunity may coexist in the same animal.

¹ Berl. klin. Wochenschr., 1900.

² Wien. klin. Wochenschr., June 14, 1900, xiii., 545–548.

³ Ann. de l'Inst. Pasteur, 1899, xiii., 406–425.

⁴ Journal of Pathology and Bacteriology, 1900, vi., 415–434.

⁵ Compt. rend. de l'Acad. de Sc., 1899, cxxix., 231.

Hæmolysins are not found in animals only. They are also produced by bacteria (Kraus and Madsen). An interesting work in this connection is that of Thorvald Madsen,¹ who experimented with the hæmolytic constituent of tetanus toxin—the tetanolysin. As shown by Ehrlich, the tetanus bacillus produces at least two distinct toxins, the tetanolysin, which is taken up by the red blood-corpuscles, and the tetanospasmin, which produces the characteristic contractions; each of these toxins has its own antitoxin. Tetanolysin was found to be a very good poison to study in order to clear up a number of theoretical questions, because the action of this substance and of its antitoxin can be readily determined by comparing the resulting color changes in the mixtures with blood. The tetanolysin is bound by the red corpuscles which, after a certain period of latency—the length of which depends on the quantity of the poison and on the temperature—are dissolved. The most important result of Madsen's studies is the demonstration that tetanolysin contains two groups of molecules, one which binds the antitoxin (hæmophorous) and one which contains the hæmolytic substances (toxophorous). These facts were readily determined by partial neutralization of the tetanolysin, which contains, as stated, substances of different action. Further experiments² showed that it is quite possible by means of the addition of antitoxin to render tetanolysin harmless some time after it is bound by the red corpuscles. This is possible not only previous to the beginning of the toxic and solvent action, but the action may be suspended at any phase of the process as long as the red corpuscles have not been dissolved. This is designated by Madsen as complete healing by antitoxin in the test-tube.

Bulloch and Hunter³ found that the filtered cultures of bacterium *pyocyaneum* contain a substance which dissolves the red corpuscles of the ox, sheep, cat, dog, and rat. This pyocyaneus hæmolysin is neutralized in vitro, the serum of goats immunized against *B. pyocyaneus*.

Epitheliolysin. Von Dungern⁴ found that ciliated epithelium of the bovine trachea maintains the motion of its cilia for two or three days when inserted into the peritoneal cavity of guinea-pigs. During this time there develops in the guinea-pig a specific anticellular body which destroys epithelial cells injected anew. The action of the antiepithelial serum is demonstrable outside of the body, though the serum is not as active outside as in the body. This serum is specific.

Von Dungern⁵ has shown later by injecting into rabbits and guinea-

¹ Zeitschr. f. Hyg. u. Infektionsk., 1899, xxxii., 215–238.

² Ibid., Ueber Heilversuche im Reagensglas, 239–245.

³ Transactions London Pathological Society, 1900, li., 192–193.

⁴ Münch. med. Wochenschr., September 19, 1899, xvi., 1228, 1229.

⁵ Ibid., May 15 and July 10, 1900, xvi.

pigs cow's milk—a product of epithelial cells—the serums of the injected animals become solvent for ciliated epithelial cells at the same time as slight hæmolytic properties develop. This would indicate that milk contains the same substances as the cells producing milk. So far efforts to produce a powerful serum destructive of epithelial cells have failed.

Nephrolytic Serum. The serum of animals may produce renal lesions when injected into animals of another species. Lindermann¹ attempted to intensify the action of the serum of guinea-pigs upon the kidney of rabbits by first injecting guinea-pigs with emulsions of rabbit's kidney. In doses of 1.25 to 2.6 c.c. per kilo such serum produces albuminuria with death, the kidneys presenting necrotic and disintegrative changes. Lindermann calls this serum nephrolytic, and believes that its specific action is caused by substances that form under the influence of the renal tissue injected. Serum of dogs poisoned with chromic acid² produces in other dogs acute, even fatal, hemorrhagic nephritis. Here, also, destruction of renal cells is regarded as increasing the nephrotoxic action of the serum. In these experiments the conditions are too complex to permit many deductions at this time.

Albert Schutze³ failed to obtain solvent serum for cells of liver and kidney of guinea-pigs by injecting intraperitoneally emulsions of these organs into rabbits.

Spermotoxin. Metschnikoff,⁴ and before him Landsteiner,⁵ have shown that when heterologous spermatozoa are injected into the peritoneal cavity of guinea-pigs there develops a substance which arrests their movements, and both express the opinion that it will be found possible to obtain serums against all kinds of cellular elements. According to Metschnikoff, spermatozoa when injected into an animal of the same or different species are first taken up while living by large cells, and subsequently immobilizing substances are formed. Pitfield also showed that spermatozoa are clumped in foreign serum.

Moxter⁶ repeated Metschnikoff's experiments and corroborated his observations, but he did not find that the specific serum had greater action than normal serum in the test-tube. In the abdominal cavity immobilization occurred a little more rapidly in immunized animals. The agglutination is specific. The serum has no effect on the cells of the testicle or on ciliated cells, but it has some hæmolytic action, the

¹ Ann. de l'Inst. Pasteur, 1900, xiii., 49-60.

² Centralbl. f. Path., 1900. xi., 308, 309.

³ Deut. med. Wochenschr., July 5, 1900, xii., 431-434.

⁴ Ann. de l'Inst. Pasteur, 1899, xiii., 737.

⁵ Centralbl. f. Bakt., Abth. I., 1899, xxv., 546-549.

⁶ Deut. med. Woch., January 25, 1900, xii., 61-64.

antibody having greater affinity, however, for spermatozoa than for blood-corpuscles. The agglutination remained marked after removal of the hæmolytic substance, thus indicating that there are at least two distinct substances present.

Métalnikoff¹ adds interesting details. Ehrlich and Morgenroth failed to obtain autolysins, but Metalnikoff shows that in guinea-pigs autospermotoxin is easy to obtain. Animals the blood of which contains autospermotoxic powers produce motile spermatozoa which are abnormally sensitive to the toxin. It is assumed that in the living body the alexin necessary to autospermotoxic action is fixed by cells, such as leucocytes, which thus prevent destruction of spermatozoa during life.

Leucocytolysins. Metschnikoff² also showed that the serum of guinea-pigs inoculated with fragments of spleen or of glands of rats acquires the peculiar power of agglutinating and dissolving the leucocytes of the rats. Similar results were obtained after like experiments with the mesenteric lymph-glands of rabbits. The serums thus obtained do not act exclusively upon any special form of leucocyte. M. Funck³ also took up this problem, introducing emulsions of the spleen of rabbits into the abdominal cavity of guinea-pigs. In this method he obtained a characteristic antileucocytic serum, dissolving alike mononuclear and polynuclear cells of rabbits; serum produced by means of bone-marrow has a more distinctly marked action on polynuclear cells. Agglutination does not precede solution of the leucocytes.

Theories of Cytolysis. In immune serums there are two distinct substances: the specific antibody (immune body of Ehrlich, substance sensibilisatrice of Bordet), which is not destroyed by heat, and the non-specific alexin (or complement of Ehrlich and Morgenroth), which is destroyed at from 56° to 60° C. Alexin of some kind is present, pre-formed in all blood (Bordet,⁴ Buchner). The specific antibody is produced during the experiments. If the serum of an animal immunized against cholera vibrios is heated at from 56° to 60° for thirty minutes its destructive powers are lost, but they may be restored by adding normal serum of the goat, guinea-pig, rat, rabbit, man, dog, fowl, and pigeon (Bordet). The same principle holds good in cytolysis. A serum containing two specific antibodies—one globulolytic the other bacteriolytic—may be active for either blood or bacterium, but not for both, because the necessary alexin is all used up in the first experiment. In hæmolysis Bordet claims that the antibody is fixed by the stroma of the red corpuscles and that the stroma is necessary for the production of hæmolytic serum. That the

¹ Ann. de l'Inst. Pasteur, 1900, xiv., 377-389.

² Ibid., 1899, xiii., 737, 765.

³ Centralbl. f. Bakt., 1900, Abth. I., xxvii., 670, 675.

⁴ Ann. de l'Inst. Pasteur, 1900, xiv., 257, 296.

antibody is bound by the corpuscles is readily demonstrated by centrifugalized mixtures of blood and antiserum heated to 60° C.

Von Dungern, Charrin, Gheorgiewski,¹ Morgenroth,² and others have experimented with pre-formed enzymes of various kinds, and a number of antienzymes have been produced by immunization. The phenomena resemble those of bacterial and toxic immunity. Morgenroth produced an antirennin by injecting goats with solutions of rennin. This antirennin greatly delayed ordinary coagulation of milk, the action upon rennin being a distinctly chemical one. And he³ has recommended this reaction of immunity to distinguish between different enzymes of similar origin.

Von Dungern showed that immune body or antibody and complement or alexin are quantitatively independent. The alexin is not increased during immunization; immune serum differs from normal serum only in the presence of the specific antibody; and the action of the antibody may be increased by adding fresh serum—*i. e.*, more alexin—to the mixtures because in the process of solution all the alexin originally present in the serum may be used up, leaving non-saturated molecules of immune body. Globulolytic and cytolytic actions like the antitoxic are, therefore, of a chemical nature.

Buchner⁴ holds that the alexins are proteolytic ferments of leucocytic origin, similar to if not identical with the digestive ferments shown by Leber and others to exist in leucocytes, and to produce the histolytic action observed in chemical suppuration, etc. He maintains the alexin necessary for hæmolysis, cytolysis, and bacteriolysis may come from animals of different species, being normally present in practically all serums. Bordet also holds that in the same serum the hæmolytic alexin is identical with the bacteriolytic. The specific body in the forms of action here discussed is the heat-resisting immune antibody. This body links the alexin to the cell, the result being solution of the cell. Attraction and union are the characteristics in the phenomena. Ehrlich and Morgenroth designate the group of the protoplasmic molecule that unites with or binds the antibody as receptor. As the antibody unites with the receptors, new molecules or receptors are produced, and eventually in such number that they are thrown off into the circulation, where they constitute the antitoxin ready to bind or unite with molecules of antibody present. This is the same theory with which Ehrlich explains all antitoxic action—the lateral chain theory. Contrary to Buchner and to Bordet, these investigators hold that there are different kinds of

¹ Ann. de l'Inst. Pasteur, 1899, xiii., 298-318.

² Centralbl. f. Bakt., Abth. I., 1899, xxvi., 349-359.

³ Ibid., 1900, xxvii., 721-724.

⁴ Münch. med. Wochenschr., February 27, 1900, xlvii., 277-283.

alexins concerned in the various forms of solvent serums and ferments.

Metschnikoff¹ emphasizes the phagocytic action of wandering cells—macrophages—a feature which he claims other investigators have failed to note sufficiently on account of the apparently purely chemical nature of these phenomena in which cells did not seem to play any active part. The macrophages not only take up dead blood-corpuscles but also living ones, as Metschnikoff claims he could demonstrate clearly in the case of the nucleated red cells of the goose when its blood is inserted into the peritoneal cavity of guinea-pigs. From the peritoneal cavity into which the foreign blood is injected the phagocytes pass into the lymph vessels, and eventually reach the circulating blood, and the order of the appearance of the agglutinating and hæmolytic substances corresponds to the various stations along this route. For this and other reasons at least one of the substances necessary for agglutination and solution, namely, the immune body of Ehrlich and Morgenroth, or the substance sensibilisatrice of Bordet, is held to be an excretion of the macrophages which have completed the intracellular digestion of red blood-corpuscles. In animals whose serum already contains antibodies, second and repeated injections of goose blood are followed by hæmolysis within the cells and in the fluids, but the cellular ferments appear then more powerful, because the phagocytes dissolve the nucleus which the serum cannot digest readily. Métchnikoff holds that the phagocytes also play a similar prominent part in the development of spermatotoxic serum.

Nolf,² on the other hand, shows by his experiments that the agglutinating properties which often appear in the serum of the animals injected with heterologous blood are produced by the stroma of the red corpuscles; that the hæmolytic qualities are brought about by fluids present in the red corpuscles and removable by repeated washing of the corpuscles; and, finally, that the injection of only blood-serum results in such changes that a precipitate forms when the serum of the animal injected is mixed with the serum of the animal furnishing the blood. These three properties are present in varying degrees in animals treated with different bloods. Nolf is opposed to the theories that explain cytolysis upon a purely chemical basis, especially Buchner's theory of fermentative action. He finds much to favor the view that cytolytic fluids act not by virtue of chemical changes, but through molecular concentration. The solution of red corpuscles in hæmolytic serums is the same as in water—the hæmoglobin diffuses, the stroma remains. May

¹ Ann. de l'Inst. Pasteur, 1899, xiii., 737-765.

² Ibid., 1900, xiv., 297-330.

not hæmolysis by immune serums, therefore, also be the result of a sudden disturbance in the osmotic equilibrium?¹

Hedon² states that red corpuscles are agglutinated only in isotonic solutions of non-electrolytic agents. Electrolytes hinder agglutination. Certainly the relations of osmosis and other phenomena to cytolysis merit investigation.

Bordet³ points out that the physical explanation of hæmolysis is objectionable (1) because hæmolytic serums are specific; (2) the hæmolytic substance of an active serum is absorbed by the stroma of corpuscles on which it acts, whereas insusceptible corpuscles do not take up the substance; (3) one of the substances in bacteriolysis and hæmolysis always remains the same, namely, the alexin.

Anticytotoxins. Not the least interesting phase of the new serum-pathology is that relating to the development of substances that neutralize hæmolytic serums. Here, again, the phenomena are identical with those observed in connection with bacterial antitoxins. Bordet,⁴ Ehrlich and Morgenroth, Schutze, and others have obtained antihæmolysins by injecting hæmolytic serums in increasing doses into susceptible animals.

Albert Schutze⁵ succeeded in immunizing guinea-pigs against hæmolytic rabbit's serum. His results seem quite positive. The antibody obtained apparently neutralizes the immune body, because heating the antiserum to 60° C. did not destroy its antihæmolytic properties. But certain experiments of Bordet and of Ehrlich point also to the production of antialexins.

Metschnikoff⁶ showed that the subcutaneous injection of rabbits with spermotoxigenic serum of guinea-pigs produces antispermotoxigenic substances, the spermatozoa remaining mobile when placed in a mixture of spermotoxigenic antispermotoxigenic serums. As the antiserum develops in castrated rabbits as well as in normal, it is plain that it may be produced by other cells than spermatozoa. Indeed, the spermatozoa of rabbits the serum of which has been rendered antispermotoxigenic are immobilized by spermotoxin—a phenomenon like that of cerebral tetanus in a rabbit actively immune against tetanus toxin. Métchnikoff shows that antispermotoxigenic serum contains an antialexin as well as an anti-immune body.

¹ Nolf's Critical Review of Globulolysis and Osmotic Pressure, *Ann. de l'Inst., Pasteur*, 1900, xiv., 492–512.

² *Compt. rend. de l'Acad. des Sc.*, 1900, cxxxi., 290.

³ Eighth International Congress, Paris, August, 1900. *Centralbl. f. Path.*, 1900, xi., 630.

⁴ *Ann. de l'Inst. Pasteur*, 1900, xiv., 257–296.

⁵ *Deut. med. Wochenschr.*, July 5, 1900, xii., 431–434.

⁶ *Ann. de l'Inst. Pasteur*, 1900, xiv., 1–12.

Deductions from the Study of Cytolysins and Practical Applications. Metschnikoff¹ likens the animal organism to a state in which the individual elements have subordinated their interests for the common good; but harmony does not always obtain in the state of cells. There are in reality struggles for existence here as elsewhere. Thus in cirrhosis we have an example of intercellular struggle in which the highly differentiated cells, rendered useless by various causes mostly of a toxic nature, are replaced by connective tissue. Metschnikoff advances the theory that in the cirrhotic interstitial processes and in atrophy and old age the phagocytes without consideration devour the cells they can overcome, no matter whether those cells are useful to the organism or not. Owing to disturbances in the internal regulating mechanisms phagocytes become predominant and disrupt the normal peace and harmony between the various cells (the underlying condition might be, I suppose, the appearance of autolysis in the body). Now, the proper remedies for the atrophic and cirrhotic processes, viewed in this light, would be various suitable anticellular serums. How far the theory of intercellular struggles may lead to renewed and fruitful study of atrophy and cirrhosis remains to be seen. The possibility of using artificial cytotoxins and antiphagocytic serums to regulate functions in chronic diseases and senile decrepitude is certainly an interesting conception. The failure of Ehrlich and Morgenroth to obtain autolysins rather speaks against Metschnikoff's idea. It is not likely that serums are obtainable against all kinds of cellular elements. The serum against old age, though not impossible, is yet far off.

Matchinsky² applies Metschnikoff's theory in explaining the atrophy of ovules in the mammalian ovary. As the ovules are "enfeebled," there begins an offensive movement on the part of the cells of the granulosa, which incorporate the ovules and are then transformed into connective tissue. And "phagocytic neurophagy" is mentioned as an explanation of some of the chronic degenerations in the central nervous system.

Cantacuzène³ found that in small doses hæmolytic serum has the paradoxical effect of greatly stimulating hæmatopoiesis in the rabbit. And Metschnikoff,⁴ in conjunction with Besredka,⁵ demonstrated that leucocytotoxin in small doses produces a marked leucocytosis. They injected goats with defibrinated human blood and the serum of the goat acquired the power to dissolve human red corpuscles. This hæmolytic goat's serum was used with considerable benefit in the treatment of two lepers: the number of red corpuscles and the quantity of hæmoglobin

¹ Ann. de l'Inst. Pasteur, 1899, xiii., 737-765.

² Ibid., 1900, xiv., 113-131.

⁴ Ibid., p. 390-401.

³ Ibid., p. 378-389.

⁵ Ibid., p. 402-414.

increased, and the local lesions improved. These results are explained as due to the general effects mentioned of small doses of hæmolysin and leucocytotoxin, and not to specific antileprous substances. Lucatello's¹ observations on the action of dog's serum treated with human blood in anæmia of children confirm the assertions of Metschnikoff and his followers.

It lies near at hand to suggest new explanations of many conditions on the strength of the results of investigations concerning cytotoxins; thus, sterility may depend in some cases on the presence of spermotoxic substances in the blood of the female.

Wassermann² has applied some of the facts observed in connection with hæmolytic serum to the practical problem of serum treatment of pure infections, which have hitherto proved so intractable to this form of therapy. It has been shown that antitoxic and bactericidal serums do not act in multiples—*i. e.*, increasing quantities of serum do not destroy correspondingly increasing quantities of microbes or cells, because there is not sufficient alexin present in the serums, and alexin is essential to solution. Alexin is present normally. (Probably not always, as Métchnikoff found a rabbit without alexin.) The immune body or antibody arises during immunization, and this body is the teeth with which the alexin grasps the microbe or corpuscle, as Wassermann puts it.

Healing of infection depends on these two factors, and Wassermann proposes to add to antiserums the normal serum of normal animals in order to increase the quantity of alexin; but every alexin does not unite with any given immune body, and to find suitable alexins for various immune bodies proves a laborious task. Wassermann found that beef-serum added to the serum of dogs immunized against *B. typhosus* served good purpose in typhoid infection of guinea-pigs. With the foregoing facts in mind the different problems in serum treatment presented by pure infections and intoxications become striking. The object of bactericidal therapy is to find suitable alexins or complements for the immune bodies (Ehrlich).

THE PATHOLOGY OF INFECTIONS.

The Bactericidal Action of Serum. The nature of the bactericidal action of various serums, generally regarded as the result of the chemical and fermentative activities of the so-called alexins, has been sub-

¹ Wiener klinische Wochenschrift, 1900.

² Deutsche med. Wochenschrift, May 3, 1900, xii., 285-287.

jected to renewed and critical investigations by Baumgarten¹ and his pupils,² Alfred Fischer,³ and others. They hold that the detrimental action of blood-serum upon many bacteria is the result of disturbances of assimilation and osmosis in the bacterial cells. Osmotic disturbances give rise to plasmolysis, as described in bacteria by Fischer; plasmolysis occurs frequently when bacilli (typhoid, colon, anthrax, cholera) are transplanted from bouillon into serum. The protoplasm separates from the wall of the bacillus and splits up into small balls. Modification of the fluids about the bacteria may restore the bacillary form, and the principal action of the serum may be a delay in the growth of organisms when transferred to nutrient media. Baumgarten holds that the so-called inactivation of serum by heating to 60° C. diminishes plasmolysis and bactericidal effects, because nutrient material is then rendered more assimilable; thus typhoid bacilli do not undergo plasmolysis in heated serum. Kraus and Clairmont⁴ show that pigeon's serum produces Pfeiffer's phenomenon with colon bacilli outside as well as inside the body. This action is permanently suspended by heating the serum to 56° to 60° C.

The conclusions of the Baumgarten school are supported by the extensive observations of Alfred Fischer on the disturbances produced in bacteria by sudden changes in the concentration of the solutions in which they may be placed. With Baumgarten and others, he holds that the osmotic sensitiveness of bacteria has not been taken into account properly in the investigations concerning bactericidal agents. Fischer shows that the well-known Pfeiffer's phenomena—disintegration of cholera spirillum in serum of immune animals—morphologically belongs to the osmotic disturbances (which often are destructive). As a result of increased pressure within the bacterial cell, protoplasmic balls may be forced out from the cell; in ciliated organisms the extrusion occurs at the points of departure of the cilia, which correspond to weak spots in the cell membrane. This form of osmotic disturbance—spewing out of cell contents—Fischer designates as plasmoptysis. The appearances thus produced probably have been observed by various investigators, for instance Rosatzin,⁵ in their observations on bactericidal serum. Fischer has studied plasmoptysis under various conditions: on transference from salt-free agar to 0.75 per cent. and 0.2 per cent. salt solution in water and in bouillon to serum, etc., and *vice*

¹ Verh. Path. Gesellschaft, 1900, ii., 242-250; and Berliner klin Wochenschrift, February 12, 19, and 26, 1900.

² Walz, Arbeiten a. d. Pathol. Anat. Institut zu Tübingen, 1899, iii., 1-65.

³ Zeitschrift f. Hyg. u. Infektionskr., 1900, xxv., 1-55.

⁴ Ibid., 1900, xxxiv., 39-79.

⁵ Untersuchungen über die bakterientödtenden Eigenschaften des Blutserums. Lubarsch: Zur Lehre von den Geschwülsten und Infektionskrankheiten, 1899.

versa. The presence of nutrient substances delays or hinders plasmolysis, showing that conditions as to nourishment must be borne in mind in studies of this kind. Now, Pfeiffer's reaction occurs under conditions admirably suited for plasmolysis, as bacteria are transferred from nutrient bouillon into serum which contains more salt and is less nutrient than bouillon. Again, transfer some serum to agar, as in testing the bactericidal action of serums by the plate method, means sudden change in osmotic and metabolic conditions. The food value of fresh and heated serum is, of course, not the same for all bacteria; as it has no diffusible albumins, the albumins and globulins are available only for bacteria with proteolytic powers; and Fischer emphasizes that in the case of many bacteria there may ensue a temporary starvation in serum until the proteolytic mechanisms are set in motion.

I have given only some of the coarser details of this interesting work, but sufficient, I believe, to show that Fischer is probably right in concluding that to establish the truth of the alexin theory new work is necessary in which all osmotic disturbances are excluded.

Plasmolysis results when bacteria are placed in hypertonic fluids. Bacteria whose membranes are easily permeated by NaCl are not readily plasmolyzed. The cholera, typhoid, colon, and pyocyanus organisms suffer plasmolysis readily. In an interesting address on some of the physiological means and methods employed by the animal organism in its struggles against bacteria, Meltzer¹ states that while Baumgarten does not discuss whether blood is plasmolytic in the living body, yet plasmolysis is probably an important factor in the defence of the organism. Meltzer regards Adami's "diplococcoid" colon bacilli (found in pathological conditions of the upper part of the digestive tract, in cirrhotic livers, in the ascitic fluid of cirrhosis, in the pancreas, and probably also in cirrhotic kidneys [Nichols]) as degenerating forms due to plasmolysis. The "latent infection" of Adami may be conceived in this light as a process of gradual immunization and as a help to life and health rather than a foe (Meltzer). In the liver, and also elsewhere, Adami observed appearances which he regards as produced by dead bacilli and bacillary fragments which have taken up iron and formed pigment granules. In cultures living diplococcoid forms may revert to typical bacilli or persist as diplococcoids with peculiar cultural characteristics. Continued growth in ascitic fluid may also give rise to fixed diplococcoids.² The persistence of living diplococcoid colon

¹ Transactions of the Congress of American Physicians and Surgeons, 1900, v., 13-25.

² The principal articles by Adami and his pupils on this subject are: Adami, Abbott, and Nicholson, *Journal of Experimental Medicine*, 1899, iv., 350-372; Transactions of Association of American Physicians, 1889, xiv., 300-322; Maude E. Abbott, *Journal of Pathology and Bacteriology*, 1900, vi., 315-326; Adami, "Latent Infection and Subin-

bacilli in cultures and subcultures is hardly explainable on the score of plasmolysis, and there is need of further study with the importance of osmotic disturbances in view.

It seems to me that some at least of the morphological changes described by Emmerich and Laida¹ in *B. anthracis* when acted on by the proteolytic enzyme of *B. pyocyaneus* (pyocyanase²) may be the result of osmotic disturbances.

Buchner³ opposes the views of Baumgarten and others. Alexins are proteolytic ferments mostly of leucocytic origin, though nearly all cells contain some alexin. Bail,⁴ and also Lubarsch, failed to find bactericidal substances in dog's serum after injecting *B. anthracis*. That alexins are not always derived from leucocytes seems clear, because in the dog the serum is not bactericidal, though leucocytes destroy anthrax bacilli outside the body, while in the rabbit the leucocytes are harmless, but the serum is bactericidal. Buchner finds much in favor of his view in the results of the recent investigations concerning bacteriolysis, cytolysis, and hæmolysis. The phenomena are governed by a general law, and they depend on the conjoint action of two substances, one of which is produced in response to the injection of various substances and resists heat, while the second is present normally and is destroyed by heating to 55° or 60° C. The second substance is the alexin and is non-specific. Bordet agrees in the main with Buchner's views. The subject is discussed further in connection with hæmolysis.

Laschenko⁵ extracted bactericidal substances from the living leucocytes of the rabbit by means of serum from other animals. As the method seemed applicable only to rabbit's leucocytes, he is inclined to exclude the action of physical agencies in the results.

Loots and Tallant's⁶ experiments indicate that loss of bactericidal power in serum heated to 57° C. is not the result of physico-chemical changes demonstrable by the conductivity methods.

Continued study of physico-chemical phenomena in relation to bacteria and bactericidal action is certainly indicated.

Bacteriolytic and Other Properties of Bile. Leubuscher, Fraenkel and Krause, and others have shown that the bile is without antibacterial influence as regards a large number of pathogenic microbes.

fection, and the Etiology of Hæmochromatosis and Pernicious Anæmia," *Journal American Medical Association*, December 23, 1899. See Also Nicholls, "On the Relation of Colon Bacillus to Chronic Nephritis," *Montreal Medical Journal*, 1899, 161-183.

¹ *Centralbl. f. Bact., Abth. I.*, 1900, xxvii., 776-787.

² See *PROGRESSIVE MEDICINE*, March, 1900, p. 277.

³ *Münch. med. Wochenschr.*, August 28, 1900, 1193-1195.

⁴ *Centralbl. f. Bact., Abth. I.*, 1900, xxvii., 10-21; *Ibid.*, 517-525.

⁵ *Münch. med. Wochenschr.*, 1900.

⁶ *Bulletin of the Johns Hopkins Hospital*, 1900, xi., 220, 221.

Fraenkel and Krause¹ demonstrated that in general tuberculosis the bile may contain virulent tubercle bacilli. That the *B. coli communis* and *B. typhosus* may flourish in the bile for long periods of time is now well known. Recently Neufeld² has discovered that the bile of man, of rabbits, and of other animals possesses a remarkable and specific bacteriolytic action upon the micrococcus lanceolatus. This power is normally inherent in bile; and Neufeld finds that rabbit's bile may dissolve in a few minutes all the pneumococci present in from ten to twenty, rarely from two hundred to three hundred, times its volume of nutrient broth cultures. The solution of diplococci in bile constitutes an excellent fluid for immunization; Neufeld succeeded in producing by this method a marked immunity, so that further experiments in this line are strongly indicated. As stated, this singular action on the part of bile is specific, and it seems that bile contains an atomic complex which is linked in a specific manner with atomic groups in the bodies of the pneumococci. Bile differs from other bactericidal juices in the body in that it retains its solvent powers as regards pneumococci after being boiled for as long as thirty minutes. The mode of origin of this property of bile is not yet known. Neufeld's researches seem to show that the solvent action is connected with cholic acid—a substance probably manufactured by the liver cells from the blood. The exact nature of this action of bile on *M. lanceolatus* is an interesting question.

Koch and later Kolle found that in rinderpest the bile acquires protective powers due to the presence of new substances arising during the course of the disease. This is consequently different from the phenomenon just described. But the action of bile toward the unknown virus of hydrophobia is not unlike that upon pneumococci. Vallée³ has shown that bile from a normal animal mixed with virus of rabies renders the latter harmless after a certain time, and this action is not abolished by heating for ten minutes in the autoclave. Vallée and also Vera Solomon⁴ regard this action of the bile as merely antiseptic. Lebell⁵ holds that the bile of rabbits suffering from rabies acquires distinct anti-toxic power; and Krause⁶ also brings evidence of the injurious action of bile on the virus of rabies. Kraus and Clairmont⁷ find that a number of birds (owls, young pigeons, geese, and chickens) are susceptible to rabies.

Bacteriolysins from Digested Bacteria. Gamaleia⁸ finds that digestion of bacteria with peptic ferments results in bacteriolytic substances

¹ Zeitschr. f. Hyg. u. Infektionskr., 1899, xxxii., 97-110.

² Ibid., 1900, xxxiv., 454-464.

³ Ann. de l'Inst. Pasteur, 1899, xiii., 506-512.

⁴ Centralbl. f. Bakt., Abth. I., 1900, xxviii., 70-79.

⁵ Ibid., 1900, xxvi., 221, 222.

⁶ Zeitschr. f. Hyg. u. Infektionskr., 1900, xxxiv., 31-39.

⁷ Ibid., 1-31.

⁸ Centralbl. f. Bakt., 1899, xxvi., 661 (Abstract).

in the fluids; the bacteriolysins may be precipitated with acetic acid and again dissolved with alkaline water. He has obtained lysins acting on staphylococcus pyogenes, streptococcus, *B. typhosus*, *B. pyocyaneus*, and *B. tuberculosis*. Perhaps new curative and vaccinate substances may be obtained along these lines.

Agglutination. The use of the agglutination test of bacteria in the diagnosis of disease is presented fully elsewhere. Here I shall give some of the more recent facts and opinions in regard to the nature of the process of agglutination and its use in the differential diagnosis of various bacteria. The literature on agglutination is growing rapidly.¹

MECHANISM OF AGGLUTINATION. Gruber holds that agglutination is the result of changes in the bacteria themselves, especially the membrane, the agglutinating substances rendering the surface of the bacteria sticky. Kobert believes that agglutination of red corpuscles by croton, ricin, and abrin is the result of the transformation of the albumin of the corpuscles into a sticky, insoluble body.

The typhoid agglutin has been made the subject of several investigations. Winterberg made a series of experiments to determine the nature and chemical properties of the typhoid agglutin, the principal result being that it is not soluble in absolute alcohol and that the formation of agglutin in the body is the result of the introduction into the body of certain insoluble parts of the cultures.

Hahn and Trommsdorff² show that in agglutination, agglutinated substances are actually used up, and they were able by means of a 1:100 normal sodic hydrate to extract the agglutinating substance from the agglutinated bacteria.

Chanoz, Courmont and Doyen³ found that exposure to a temperature of 180° C. does not destroy the agglutinating property of serum.

Ernst and Robey conclude a brief review concerning the mechanism of agglutination by saying that agglutination is not dependent upon the flagella of the bacteria concerned; it is not a specific property connected with immunity; its homologous nature not a positive character-

¹ Krause, Wiener med. Wochenschr., 1899, No. 29; Ernst and Robey, Journal of the Boston Society of Medical Science, 1900, iv., 219-228; Max Grubler, Münch. med. Wochenschr., October 10, 1889, xlv., 1329-1332; Winterberg, Zeitschr. f. Hyg. u. Infektionskr., 1899, xxxii., 375-401; Jatta, *ibid.*, 1900, xxxiii., 185-235; John McCrae, Montreal Medical Journal, May, 1900; Radziewsky, Centralbl. f. Bakt., Abth. I., 1899, xxvi., 753-757; Antonio Rodella, *ibid.*, Abth. I., 1900, xxvii., 583-591; Bourges and Mery, Arch. méd. exp. et d'Anat. path., 1900, xii., 132-188; Sabrazes and Bréngues, Compt. rend. de la soc. de biol., II Series, I., 930; Rodet, Journ. de phys. et path., 1900, ii., 154; *ibid.*, 615-629, 629-644; H. C. Ernst, Philadelphia Medical Journal, May 5, 1900, v., 983; Rothberger, Zeitschr. f. Hyg. u. Infektionskr., 1900, xxxiv., 79-119; Sternberg, *ibid.*, 349-368.

² Münch. med. Wochenschr., March 27, 1900, xlviii.

³ Compt. rend. de la soc. biol., 1900, lii., 764.

istic (typhoid bacilli are clumped by diphtheria antitoxin); there is no universally applicable explanation as yet offered; the theory of an agglutinating substance acting upon one which is agglutinable is the most rational yet suggested.

SERUM SUBSTITUTES. Blachstein¹ claims that all forms of cholera vibrios are agglutinated by dilute solutions of chrysoidin, provided they have been grown on neutral media. If grown in alkaline media, enough alkali is assimilated to render chrysoidin inactive. The Finkler-Prior vibrio is agglutinated, whether grown on neutral or alkaline soils. Chrysoidin is disinfectant and agglutinating for cholera vibrios in a dilution of 1:1000 in distilled water. Hence, chrysoidin is a test for cholera vibrios that surpasses the serum test in accuracy and applicability—an efficient serum substitute and agglutino-disinfectant.

COLON AND TYPHOID BACILLI. John McCrae reports the results of 300 agglutination tests with *B. coli* and human serum. Three forms of *B. coli* were used: (1) Showing fermentation and acid formation in a slight degree; (2) in a moderate, and (3) in a marked degree. The dilution of fresh serum was 1:10.

Ten positive and eighteen suggestive reactions were obtained, “suggestive” meaning clumping without clearing of the field between the clumps. Form 3 produced eight of the positive and fifteen of the suggestive reactions.

The diseases were bronchitis, typhoid fever, anæmia, gastric ulcer, gastritis, and five undiagnosed cases in the ten positive results.

In twenty-three cases of possible *B. coli* infection (cholecystitis 1, appendicitis 3, typhoid fever 11, and probably typhoid fever 8) no reaction resulted.

Some of the inferences are:

The liability of a strongly acid and gas-producing bacillus to clump.

No increased reaction in acute infections, such as appendicitis, cholecystitis, etc.

A decided reaction of *B. typhosus* is accompanied by a low degree of reaction to *B. coli*.

A mere taking up and destruction of small numbers of bacilli by the tissue cells is insufficient to develop the serum reaction. An acute proliferation is necessary, and since this proliferation in the intestine under normal conditions produces no reactive substances in the circulating blood, some intimate reaction between the invading bacilli and the tissues must take place.

Radziewsky² publishes an extended study of bacterium coli, based on

¹ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 890-901.

² Zeitschr. f. Hyg. u. Infektionskr., 1900, xxxiv., 369-453.

a thorough examination of the biology of seventy-one different organisms, sixty-four of which were obtained from the intestines of one and the same individual (healthy). It is important to note that there is no unity in the behavior of various colon bacilli toward agglutinating serums (from animals); bacilli from the same intestine may react differently toward the same serum. A coli-serum may be almost specific or it may agglutinate a large number of varieties. Two coli-serums that have no reciprocal action may both agglutinate a third bacillus in the same degree. A colon bacillus with increased virulence from repeated animal passages may present different agglutinative properties than in its original form. These results indicate that the colon group contains a large number of subvarieties.

Mauro Jatta concludes a study of agglutination of typhoid bacillus and bacilli from the colon group in part as follows: Typhoid serum occasionally agglutinates colon forms more strongly than normal serum before immunization, and colon serum in like manner may agglutinate typhoid bacillus stronger than normal serum. Ten typhoid cultures showed no special differences in their relation to the action of the serum of animals inoculated with any one of them or with a colon organism; twenty-eight colon cultures, on the other hand, showed much greater deviations under these conditions. Among other interesting observations, Jatta found that on the second and third day after inoculation of the typhoid bacillus the agglutinating power of the spleen is more pronounced than that of the serum; later the conditions are reversed.

A bacillus, suspectedly typhoid, but not agglutinated by typhoid serum or by such approximated dilutions as agglutinate the typhoid bacillus, cannot be regarded as typhoid bacillus. In doubtful cases the diagnosis of typhoid is to be made only when the serum has a high agglutinating power, as 1:1000.

Rodet also notes that coli-serums may agglutinate typhoid bacilli, and *vice versa*; and Sternberg shows that agglutination is not reliable in the diagnosis of water bacteria, as he found a bacillus which was agglutinated by typhoid serum in a dilution of 1:1000.

SERUM DIAGNOSIS IN GLANDERS. Bourges and Mery¹ found that if the serum of a horse agglutinates the bacillus of glanders when diluted to 1:300, then there is a reasonable certainty that the horse has glanders. Agglutination by less dilute mixtures is of no significance.

AGGLUTINATION OF B. DIPHTHERIÆ. Lubowski² studied fully an avirulent and atoxic, but otherwise typical, diphtheria bacillus obtained from the throat of a sick adult, whose blood-serum contained diphtheria

¹ Arch. Méd. exp. et d'Anat. path., 1900, xii., 182-188.

² Zeitschr. f. Hyg. u. Infektionskr., 1900, xxxiv., 87-103.

antitoxin. In order if possible to identify this bacillus, he resorted to agglutination. Serums of animals inoculated with large quantities of the bacillus agglutinated twenty-three different families of diphtheria bacilli, the avirulent bacillus itself and another bacillus of the same kind, but not pseudodiphtheria bacilli or other organisms. Hence the avirulent bacillus is assigned to Löffler's bacilli. This shows that the virulency, already known to be variable in these and other germs, may be wholly lost.

AGGLUTINATION OF PROTEUS VULGARIS. Antonio Rodella¹ shows that the blood of guinea-pigs acquires specific agglutinative powers as regards proteus vulgaris after injection of virulent cultures, cultures killed by heating to 60° or 100° C., and filtrates. The agglutination appears earlier after intraperitoneal injection than on subcutaneous. Repeated feeding with proteus cultures also induces agglutination. The serum of new-born guinea-pigs is agglutinative if the mother receives virulent cultures twenty to thirty days before birth; now the milk is also agglutinating. Filamentation occasionally occurs.

MICROCOCOCCUS LANCEOLATUS. Bezancon and Griffon² show that by growing micrococcus lanceolatus in the undiluted serum of animals and of human persons recently infected with this organism a fairly constant and typical agglutination is obtained. The agglutination is best seen in the test-tube, where a distinct precipitate forms in the agglutinating serum, while in normal serum a diffuse cloudiness results. Microscopically dense masses and tangled chains are formed; this reaction occasionally occurs without distinct precipitate. Experimentally immunized rabbit's serum showed this power in high degree, and even after some dilution of the serum. The phenomenon disappeared early. In lobar pneumonia the reaction was well marked, especially shortly before the crisis. The early disappearance of the agglutinating power of the serum does not permit a retrospective diagnosis as does the Widal reaction of typhoid. The authors also obtained agglutination in other forms of primary and secondary pneumococcus infections. It was also soon found that various but identical cultures of pneumococci do not react in the same manner toward the same serum, some being agglutinated, others not; but this is rather rare. In such cases the culture obtained from the same person as the serum is the one surest and most typically agglutinated. This observation is in line with others which show that organisms existing as saprophytes in the human body (colon bacilli, etc.) do not react as specifically to the agglutination test as the typhoid bacillus.

¹ Centralbl. f. Bakt., Abth. I., 1900, xxvii., 583-591.

² Ann. de l'Inst. Pasteur, 1900, xiv., 449-463.

CLUMPING OF BLOOD-CORPUSCLES. Shattock¹ shows that the rouleaux formation of red blood-corpuscles—a kind of agglutination—is markedly influenced by substances in the serum of the blood. This property is especially marked in horses' blood. Wharton Jones and others long ago ascribed the buffy coat of the shed blood of inflammatory diseases to closer aggregation and sedimentation of red corpuscles; and Shattock, acting on this hint, finds that in lobar pneumonia the serum has a distinct and marked agglutinating power on the red corpuscles. Similar action was seen in erysipelas, acute articular rheumatism, and in typhoid fever. These observations explain well the buffy coat in the shed blood, and also the large, yellow, fibrinous clot found in the heart and the large vessels in such diseases as pneumonia. Whether agglutination of chromocytes occurs during life, and the possible relations that such clumps may have to thrombi, has not yet been studied.

FILAMENTATION OF BACTERIA. When the colon bacillus is placed in the serum of the patient whose disease it produced, and from the lesions of which it is isolated, it occasionally grows out into long threads, as if multiplication without separation were taking place. This is described by Pfaundler as filamentation, and it is attributed by him to a sort of counteraction of the organism to the conditions to which it is exposed in the serum. The ordinary morphological and cultural peculiarities of bacilli which present this property of filamentation are not changed. Kraus and Low² have observed thread formation on the part of the colon bacillus, the typhoid bacillus, the cholera vibrio, and the bacillus mucosus capsulatus; but they do not regard the change as of any specific significance, and it is evident that further observations are necessary before we can attempt to explain the phenomenon. Kraus holds that filamentation is always preceded by agglutination, the laws of which it obeys except in the case of the colon bacillus.

Rothberger also saw filamentation of *B. coli* in agglutinating serum.

The Conjunctival and Other Routes of Infection. Römer's³ experimental study of infection through the conjunctiva shows that in rabbits and guinea-pigs this membrane is as dangerous if not more so than any and all other recognized routes of general infection; preliminary injury is not necessary. In many cases the infection is generalized more rapidly than after subcutaneous introduction. The germs do not enter the circulation directly, but through the nasal mucous membrane, whose resorptive activities play the principal part in the general infection; by means of histological sections Römer demonstrated that corpuscular elements, such as carmine, introduced into the conjunctiva are carried

¹ Journal of Pathology and Bacteriology, 1900, vi., 303-314.

² Wiener klin. Wochenschrift, February 2, 1899, xiii., 95-98.

³ Zeitschr. f. Hyg. u. Infektionskr., 1899, xxxii., 295-326.

to the nose by the tear passages and then taken up and deposited in the submucous lymphatics. Römer's studies also throw light on the mode of infection in acute meningitis. Key and Retzius demonstrated that the lymphatics of the nasal submucosa communicate with the cerebral membranes by spaces in the sheaths of the olfactory nerves. Micro-organisms, reaching the lymph vessels of the nose, have thence a straight road to the meningeal lymphatics, and perchance in meningitis the nose is invaded from the conjunctiva. Römer emphasizes the importance of dust, especially in local conjunctival infections; it not only causes epithelial lesions, but under its influence the bacterial content of the conjunctival sac rises above the normal.

G. Mayer corroborates Römer's¹ results as regards the rapidity of infection from the conjunctival sac with a large number of bacteria. *B. mallei* and *B. tuberculosis* caused a chronic infection when placed in the conjunctival sac of animals. *B. diphtheriæ* and *staphylococcus aureus* caused local infections and the first death by intoxication. The organisms of cholera, typhoid fever, and actinomycosis do not cause general infection from the conjunctiva. Mayer gives a large number of bacteriological and histological details which cannot be given here.

Marcus² made some experiments upon the passage of bacteria from the intestines into the urine and the blood. Hæmatogenous infection rarely follows ligation of the rectum in the rabbit; infection of the peritoneum and of the uterus may result from direct and lymphatic passage of bacteria; but the infection is a local one and not, as claimed by Posner and Levine,³ hæmatogenous.

Pawlowsky⁴ shows that after subcutaneous injection microbes rapidly reach the blood and the internal organs, and in such numbers that transference by phagocytes seems excluded. An early preliminary elimination occurs through the bile and the urine. As the microbes disappear from the blood (twenty-four to seventy-two hours after infection) they are deposited in the liver, lungs, kidneys, and spleen especially, the irregularity of distribution sometimes observed being explainable by the irregular distribution of bactericidal substances, the bone-marrow containing most. Phagocytosis is most marked in immunized animals, but is undoubtedly subordinate to the chemical action of the body juices.

Schnitzler⁵ studied the question of latent infection in the apparently healthy body. Osteomyelitis and late suppuration at the site of injuries and around foreign bodies point to the latent presence of bacteria.

¹ Münch. med. Wochenschrift, August 21, 1900, xlvii., 1169-1175.

² Zeitschr. f. Heilk., 1899, xx., 427-458.

³ Quoted by Marcus.

⁴ Zeitschr. f. Hyg. u. Infektionskr., 1900, xxxiii., 261-312.

⁵ Centralb. f. Chirurg., 1899, No. 27.

Schnitzler found virulent staphylococci in the detritus in an operated area one year after complete clinical healing, and also one and one-half years after the subsidence of all inflammatory signs on the part of an osteomyelitic focus. Staphylococci and sarcina were recovered from the bone-marrow.

Laitinen¹ shows that in the ordinary laboratory animals alcohol increases the susceptibility to infection, no matter whether administered in small, frequently repeated or few and massive doses. There seems to be no experimental support for the internal use of alcohol in the treatment of infectious diseases in man.

The Phenomena of Infection. Radziewsky² shows that fatal infection of guinea-pigs with colon bacilli is associated with two parallel phenomena: multiplication of bacteria, on one hand, and deformation and solution, on the other. The solution is extracellular, and is produced by substances newly formed. In natural immunity from *B. coli* the bacteriolytic action of the peritoneal fluid is of paramount importance in peritoneal infections. Extracellular action is also the predominating one in passive immunity. The bacteria found in the cells are most of them deformed; but the number within cells is insignificant.

Radziewsky³ has confirmed for *B. typhosus*, *diplococcus lanceolatus*, *streptococcus pyogenes*, *B. anthracis*, *B. pyocyaneus*, and the comma bacillus the observation that fatal infections are associated with multiplication and with destruction of bacteria. Multiplication occurs in the first stage; later microbes are dissolved by substances in the body fluids, and bacterial toxins are set free which then determine the clinical feature of the infection.

PATHOGENIC MICRO-ORGANISMS.

Variations Among Pathogenic Bacteria. In his paper before the meeting of the Society of American Bacteriologists at New Haven, December 27, 1899, Theobald Smith⁴ points out that neglect of variability of bacteria results in the establishment on inefficient grounds of numerous species at the same time as it tends to reduce the etiological importance of pathogenic organisms, which, according to some, become merely the liberating impulses of diseases, the essential causes residing in the individual. The existence of closely related forms is well established. Thus, the bacilli of mammalian tuberculosis manifest at least three types of virulence, high (bovine), medium (horse), and low (human),

¹ Zeitschr. f. Hyg. u. Infektionskr., 1900, xxxiv., 206-253.

² Ibid., 369-453.

³ Centralbl. f. Bakt., Abth. I., 1900, xxviii., 161-164.

⁴ Journal of Boston Society of Medical Science, 1900, iv., 95.

as shown by Smith's own studies. Whether the bovine bacilli rapidly lose virulence in the human body, or whether tuberculosis is not transmitted from cattle to man, except in those cases in which the bovine organism is actually found, is a problem of great practical importance. Variations in *B. diphtheriæ*, *pyocyaneus*, *coli communis*, etc., are also recognized. Studies of variability of bacteria must be comparative, because, in becoming parasitic, a bacterium adapts itself to many hosts. This evolution of parasitic from saprophytic bacteria is surely a very interesting subject. The mechanisms are complex and variable; changes in form and in function occur; the final and rather definite relationship established between host and parasite furnishes fairly constant types of disease. Speculation has recently been started in regard to the evolution of the tubercle bacillus by the discovery of numerous acid-proof organisms¹ in grasses and elsewhere, but we know so little of the real nature of such problems that we are not in a position to draw any reliable inferences as to the time required for the parasitic adaptation of free-living forms. Smith points out that the conditions are not favorable for permanent natural parasitic adaptation, otherwise new diseases should be constantly appearing in view of the enormous number of bacteria everywhere present. A plastic constitution and such qualities as toxin production seem requisite for parasitic adaptation; and by adaptation to various hosts many diseases result from a comparatively small number of bacteria.

Ohlmacher² describes two marked examples of morphological variation of pathogenic bacteria. One was a streptococcus from follicular tonsillitis, which in Löffler's serum grew into rods of diverse shapes and sizes, greatly resembling *B. diphtheriæ*. In broth, on the other hand, the streptococoid form reappeared. The second was a colon bacillus from cholecystitis, which presented remarkably long and tangled threads as well as minute cocci and diplococci. Eventually the bacillus, after repeated subcultures in broth, returned to more familiar forms. The recognition of morphological variation is of great practical importance, as in diphtheria.

Pathogenic Cocci. PNEUMOCOCCUS AND ITS TOXINS. The studies of the toxins of the pneumococcus are not many, the reasons probably being the difficulty in obtaining virulent pneumococci and active toxins. P. Carnot and Fournier³ studied first the various methods calculated to maintain the vitality and the virulence of the pneumococcus. The extreme sensitiveness of the pneumococcus to thermal and chemical

¹ PROGRESSIVE MEDICINE, March, 1899, p. 226; *ibid.*, March, 1900, p. 202.

² Philadelphia Medical Journal, June 5, 1900.

³ Arch. de Méd. exp. et d'Anat. path., 1900, xi., 357-378.

changes are well known. Many races die out after one or two days. Others are more tenacious, even growing in gelatin at the ordinary temperature. On account of the difficulty of preparing media containing blood, these authors sought for an organic medium easily obtainable. This, they believe, is found in nervous tissue (man, rabbit), as with it they were able to keep cultures alive for seven months. Fresh, unfiltered nervous substance drawn into pipettes was used with advantage. Macerated, filtered, and sterilized cerebral nervous tissue was also used. They obtained especially good results by cultivating pneumococci in a dialyzing tube surrounded by ordinary bouillon or serum, thus allowing the toxin to pass out and nutritive substances to pass in. The pneumococcus grows freely, forming large cocci, often encapsulated and remaining alive for a long time. The toxins are now easily obtainable in pure form.

Symbiosis with other bacteria may also be studied. The dialyzed toxins are pathogenic; the fluid is concentrated by evaporation in vacuum or by adding phosphate of sodium and a few drops of a solution of chloride of calcium; the resulting precipitate (phosphate of lime) carries down toxins.

In the rabbit the pneumococcus produces a septicæmia, no matter what the mode of injection. Guinea-pigs offer more resistance, and in them local lesions are obtainable as in the case in man. Carnot and Fournier were unable to modify the results in the rabbit. Intracerebral injection of a few drops quickly produced a fatal septicæmia with great exaltation of virulence. Repeated passages resulted in hemorrhagic lesions. The most interesting lesions are the muscular (skeletal, cardiac, vascular, intestinal). The skeletal muscles become translucent, vitreous, like fish; friable, often ruptured, often hemorrhagic. The heart is dilated, distended with clots, and flaccid. Rapid healing may occur. Toxins produce the same lesions.

HISTOLOGY OF LOBAR PNEUMONIA. Pratt¹ reports the result of the histological examination of fifty cases of lobar pneumonia. Early in the disease the alveoli contain many cells similar to the transitional cell of the blood; these cells were found in great numbers in a case in which death occurred eleven hours after the onset. They are regarded, however, as originating from the epithelium lining the alveoli, although they may be transitional leucocytes that have emigrated. After the first forty-eight hours the polymorphonuclear leucocytes are the predominating cells in the exudate. Large phagocytic cells occur in all

¹ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 265-277; also Journal of the Boston Society of Medical Science, 1900, iv., 183, 184. (Abstract.)

stages, but especially in that of gray hepatization. The inclusions are mostly polymorphonuclear leucocytes, lymphocytes, and more rarely red corpuscles. The phagocytic cells are also traced to the alveolar epithelium; they resemble greatly endothelial phagocytes. The fibrin is more abundant at the periphery than in the centre of the alveoli. Thrombi composed of fibrin are frequent, as are emboli of giant cells from the bone-marrow. During the later stages there is often great infiltration of the interstitial tissue with lymphoid and plasma cells.

PRECIPITATION OF ALBUMIN BY PATHOGENIC STREPTOCOCCI. Libman¹ mentions a pathogenic streptococcus that has the peculiar characteristic of turning glucose and lactose agar white, though the growth is confined to the surface; this was especially marked in agar to which had been added hydrocele fluid. This change seems to be caused by the precipitation of the albumin by some acid. Libman reports that a number of pathogenic bacteria precipitate serum-albumin and egg-albumin most constantly in the presence of glucose. Important problems growing out of this observation are reserved for a more extended paper.

MICROCOCOCCUS TETRAGENOUS SEPTICUS. Bosc² describes a case of acute choleriform enterocolitis, fibrinopurulent and suppurative peritonitis, suppurative bronchitis, and bronchopneumonia in a man, aged twenty-one years, caused by this organism, which was the only organism present in the smear and cultures from the pia. It is thought that the enterocolitis resulted from the swallowing of sputum laden with tetrads, the peritonitis resulting from propagation, there being no perforation of the intestine present. There were several small abscesses filled with viscid pus in the pelvis near those parts of the intestine most severely involved. There was an extensive suppurative bronchitis and peribronchitis, and a fibrinous and hemorrhagic bronchopneumonia surrounded by a zone of desquamative and cellular inflammation. The bronchopneumonic areas were exceedingly hemorrhagic. The viscous character of the abundant grayish pus is attributed to the presence of enormous numbers of tetrads with mucoid capsules, free and intracellular. The liver, spleen, and kidneys were sterile.

Pathogenic Bacilli. BACILLUS PYOCYANEUS AND ITS PIGMENTS. From a thorough study of the bacillus pyocyaneus and its pigments, E. O. Jordan³ concludes that the fluorescent pigment formed by some varieties of *B. pyocyaneus* is produced under the same conditions as that of other "fluorescent bacteria." Pyocyanin is formed in proteid

¹ The Medical Record, 1900, lvii., 842.

² Arch. de Méd. exp. et d'Anat. path., 1900, xii., 159-180.

³ Journal of Experimental Medicine, 1899, iv., 627-647.

and non-proteid media, and does not depend for its production on either phosphate or sulphate. The pyocyanigenic power is lost sooner than the fluorescigenic, and the natural and acquired differences in pyocyanigenic is greater than those of the fluorescigenic. Fluorescent pigment may be oxidized into a yellow pigment, and pyocyanin into a black. *B. pyocyaneus* may be divided into four varieties—pyocyanigenic and fluorescigenic, pyocyanigenic only, fluorescigenic only, and non-chromogenic. These varieties are not readily converted into one another.

BACILLUS AËROGENES CAPSULATUS. W. T. Howard¹ reviews the literature bearing on this interesting organism, and reports in detail a number of cases illustrative of its manner of entrance into the body and its distribution. In 106 autopsies invasion with *B. aërogenes capsulatus* was demonstrated in eleven, the majority being instances of agonal invasion, but in several the bacilli probably entered during life. In one group the entrance point was in the genito-urinary tract; two interesting cases are cited of this kind, one of which was referred to in *PROGRESSIVE MEDICINE*, March, 1900. In the second group invasion took place through the biliary tract. It contains two cases, the only ones so far reported of their kind. In one case the gas was limited to the gall-bladder; in the second case the gas in the gall-bladder and liver was excessively marked. In the third group the point of invasion was lesions of stomach and intestines, such as typhoid ulcers and strangulated hernia. In some instances there was focal disintegration of the mucous membrane of the stomach or intestines, especially under the folds of the valvulæ conniventes, associated with gas bubbles and bacilli. Close examination may be necessary to demonstrate gas, gas cysts, and bacilli in the organs.

Bacillus aërogenes capsulatus is widely distributed. Emphysematous gangrene following crushing injuries shows that it is often present in dirt and dust. Invasion of the genito-urinary system indicates its presence on the skin about the genitals and anus. And it is certainly common in the intestinal tract. In twenty-five consecutive autopsies Howard found bacilli morphologically like the *B. aërogenes capsulatus* in smears from the digestive tract, and in ten rabbits, inoculated with intestinal contents, killed and put in the incubator, developed general gaseous emphysema.

As regards the distribution in the body, it is easy to understand that invasion during life and at the agony may result in a wide dissemination, but it is more difficult to explain the distribution in the cases of

¹ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 461-495.

post-mortem entrance. The bacillus is non-motile. Howard thinks that in this case the bacilli gain entrance into intestinal veins, whence they reach the liver and large veins, and are then carried mechanically with the blood as it recedes by gravitation into the smaller vessels. Gas bubbles might also carry bacilli.

The effects of the bacillus upon the tissues are variable. During life it may produce inflammatory changes and necrosis, with complete disintegration. Gas may or may not be produced, and the factors determining gas production are not understood. In guinea-pigs and pigeons inoculation gives rise to œdema, hemorrhage, emphysema, and wide and severe necrosis.

Welch¹ reviews the whole literature on *B. aërogenes capsulatus*, and discusses in full the history, characters, and various morbid conditions caused by this organism, which he discovered in 1891. The most important morbid process caused by the gas bacillus of Welch is emphysematous gangrene. From a review of the cases of emphysematous gangrene reported during the last seven years, Welch shows that the gas bacillus is the one organism most commonly present in this dreaded disease; it may be present alone or in conjunction with pus cocci and other pathogenic bacteria. The relations of the gas bacillus to foamy organs and to air embolism are fully discussed, and it is shown very definitely that *B. aërogenes capsulatus*, or bacillus *Welchii* (Migula), practically dominates the whole field of pneumatopathology. The most direct practical value to be derived at this time from the accumulated knowledge of the gas bacillus of Welch is found in the fact that by systematic bacteriological methods (anaërobic cultures and the development of gas in the bodies of rabbits killed a few moments after intravenous inoculation with the bacillus) it is possible to make an early diagnosis of cases of emphysematous phlegmonous processes and institute successful therapeutic measures.

BACILLUS DYSENTERIÆ. The study of intestinal bacilli has received a new impetus through the investigation of Flexner² and others³ on the etiology of dysentery, which is a common disease in the Philippines. Shiga's results are confirmed. *B. dysenteriae* of Shiga is related in its cultural and physiological properties to *B. typhosus*. "Comparison of the Eberth-Gaffky and Shiga bacilli show the criterions of differences to be by no means numerous. The main features, however, are as follows: The latter show less marked motility when first isolated and a tendency to lose motility rapidly in artificial cultivations; it displays

¹ Boston Medical and Surgical Journal, July 26, 1900, cxliii., 73-87 (Shattuck lecture).

² Philadelphia Medical Journal, September 1, 1900, vi., 414-424.

³ Strong and Musgrave: Journal of American Medical Association, August 25, 1900, xxxv., 498-500.

a more uniform generation of indol ; after a brief preliminary acid production in milk it gives rise to a gradually increasing alkalization ; it is inactive to blood-serum from typhoid cases ; but reacts with serum from dysenteric cases to which *B. typhosus* does not respond " (Flexner). The results of the agglutination test tend to confirm the possibility that the acute dysenteries of the tropics are caused by *B. dysenteriae*. Of 111 fatal cases of dysentery in Manila, Strong and Musgrave class 32 as bacillary and 79 as amœbic. *B. dysenteriae* was isolated from each of the 32 cases, 21 of which were acute and 11 subacute.

BACILLI OF THE HOG-CHOLERA GROUP. Harvey Cushing¹ describes a case, resembling typhoid, and followed by osteomyelitis due to a bacillus of the hog cholera or *B. enteridis* (Gärtner) type, intermediate between the typhoid and colon groups. The clinical significance of this intermediate group has been much slighted. It differs from the bacillus of typhoid in some of the fermentation reactions (producing gas in glucose and other carbohydrates) ; and from *B. coli communis* by the fact that fermentation in mild media does not produce acid enough to precipitate casein, the transitory acid production being followed by alkalization. Reed and Carroll have shown that Sanarelli's bacillus *icteroides* belongs to this intermediate group.² Cushing emphasizes that allied or typical bacilli of these various groups sojourning in the intestine may find their way into the portal circulation during fevers with intestinal lesions, and mask the original disease. The colon bacillus, however, a permanent intestinal inhabitant, is rarely found beyond the abdominal cavity. Gwyn's paracolon bacillus and Cushing's bacillus were isolated far away from the abdominal cavity ; the patient's blood agglutinated these organisms strongly, but not *B. typhosus* ; hence it is not improbable that they were the specific cause of the disease which resembled typhoid fever. The organisms of the Gärtner group, though distinguishable by their response to specific serums, are culturally practically identical.

I copy Cushing's conclusions :

"CHIEF DISTINGUISHING FEATURES OF THE EBERTH OR TYPHOID, GÄRTNER OR INTERMEDIATE, AND ESCHERICH OR COLON GROUPS. *B. typhosus*. An actively motile bacillus possessing as many as fourteen flagella at times and having marked pathogenicity toward man, though slight toward the lower animals. Reaction in milk is acid, with a very late (months) or no terminal alkalinity. The organism ferments glucose but not lactose, and produces no gas from any carbo-

¹ Bulletin of the Johns Hopkins Hospital, 1900, xi., 156-170.

² This report has excited considerable controversy, and the question of the biological and etiological relationships of *B. icteroides* is not yet definitely settled.

hydrate medium. Under ordinary conditions of isolation there is no production of indol.

Fermentation reactions :

	Dextrose.	Lactose.	Saccharose.
Total gas :	0	0	0
Aërobic :	Acid	Alkaline	Alkaline.
Reactions :			
Anaërobic :	Acid	Neutral	Neutral.

“*Intermediate Group.* B. Gärtner and B. chol. suis type. Bacilli with the morphology of B. typhosus and possessing an equal or greater number of flagellæ. Actively motile and in many cases having a distinct pathogenicity for both man and animals. Reaction in milk presents an early and terminal strong alkalinity in the presence of air, appearing after a transient acidity. Milk is never coagulated. They ferment glucose, with the production of gas, never lactose or saccharose. Under ordinary cultural conditions no indol is produced.

Fermentation reactions :

	Dextrose.	Lactose.	Saccharose.
Total gas :	$\frac{1}{2}$	0	0 or bubbles.
HCO ₂ :	2/1	0	0
Aërobic :	Acid	Alkaline	Alkaline.
Reactions :			
Anaërobic :	Acid	Neutral	Neutral.

“Bacillus O. and B. paracolon (Gwyn) may represent a subdivision of this group, being slower in their action on milk and growing less luxuriantly and more like B. typhosus in various fluid media, and resembling it in their pathogenic action on animals.

“*B. coli and its many allied forms.* A bacillus with sluggish motility possessing few flagella. Pathogenicity ordinarily is slight for man and animals. Growth on potato is abundant and colored. No alkalization in aërobic growth. Reaction in milk is acid, invariably sufficient for coagulation. It ordinarily produces a large amount of indol. It ferments glucose and lactose. Saccharose may or may not be acted upon.

Fermentation reactions :

	Dextrose.	Lactose.	Saccharose.	
			Var. (a)	Var. (b)
Total gas :	1/2	1/2	0	2/3 slow.
HCO ₂ :	2/1	2/1	0	3/2.
Aërobic :	Acid	Acid	Alkaline	Acid.
Reactions :				
Anaërobic :	Acid	Acid	Alkaline	Acid.”

BACILLUS DIPHTHERIÆ AND ALLIED ORGANISMS. Bergey¹ has studied a long series of cultures of diphtheroid bacilli from various sources. He places them in two groups according to their cultural

¹ Contributions from the Laboratory of Hygiene, Publications of the University of Pennsylvania, 1898.

peculiarities, the so-called "pseudodiphtheria bacilli" and the "xerosis bacilli." He considers these groups of organisms closely related to Löffler's bacillus, but believes they are distinct organisms and not attenuated, avirulent Löffler bacilli. This author's experience has been that where Neisser's differential staining method has been systematically employed a safe differential diagnosis can be made.

Animals inoculated with the bacilli showed a slight subcutaneous oedema at the point of inoculation and loss of weight. Only occasionally an animal died; but, so far as could be determined, death was always due to some intercurrent affection. He concludes that if these bacilli are "capable of producing any lesions whatever they are of a mild character and largely local in their manifestation."

After discussing the findings of the various observers in regard to the relations of the xerosis bacillus to non-toxicogenic diphtheria bacilli, Schanz¹ concludes that the xerosis bacillus is nothing different from the pseudodiphtheria bacillus—*i. e.*, a non-poisonous diphtheria bacillus, especially because of their cultural similarities.

De Simoni's² studies were made upon sixteen different cultures of pseudodiphtheria bacilli, obtained from various affections of the conjunctiva, nose, mouth, skin, etc.

Experiments to determine their pathogenic properties were conducted under several different plans:

1. By subcutaneous, intrapleural and intra-abdominal injections in guinea-pigs and intravenous injections in rabbits. In these the results were always negative, with exception of some local swelling and emaciation.

2. By injection of bacteria grown in association with the true diphtheria bacillus, the pneumococcus, and the proteus vulgaris. All the animals remained alive, showing only local swelling and emaciation.

3. By injection of bacilli grown upon pieces of liver, kidney, and spleen of animals dead after inoculation with diphtheria bacillus, pneumococcus, and tetanus bacillus. Those from the first two were negative. Those from tetanus organs killed guinea-pigs and rabbits in eight to fourteen days if grown four to six days, and quicker if grown longer. Cultures grown upon a culture of tetanus bacillus upon agar slant killed in four to six days or quicker if grown longer. The pathogenic action was due to the protein of the pseudodiphtheria bacillus, rendered toxic through association with the tetanus poison. Virulence was lost by transplanting three times on glycerin agar.

The bacilli are divided into four groups according to the slight or

¹ Zeitschr. f. Hyg. u. Infektionskr., 1899, xxxii., 435-442.

² Centralbl. f. Bakt., Abth I., 1899, xxvi., 673-693 and 757-763.

more abundant growth upon agar, the ability to grow on gelatin, the production of acid, chromogenesis, etc.

Simoni's conclusion is that pseudodiphtheria bacilli are harmless for ordinary experimental animals, but by symbiosis with other germs may acquire a high degree of toxicity, which is again rapidly lost, and that the varieties are members of a group and not modification of one bacillus.

Gromanowsky¹ also studied the differential diagnosis of various kinds of pseudodiphtheria bacilli and their relation to Neisser's stain. He found a rather thick, acidifying bacillus which does not make bouillon cloudy, but takes Neisser's stain. The bacillus that resembled *B. diphtheriae* most morphologically did not stain with Neisser's method.

Macfadyan and Hewlett² found in the throats of pigeons an organism that culturally and morphologically corresponded to *B. diphtheriae*; but it had no pathogenic or toxic powers toward guinea-pigs. Neisser's stain positive.

Waelsch³ isolated from the vesicles and pustules of a pemphigus vegetans a bacillus that belongs to the diphtheria group. The cultures were toxic in high degree for guinea-pigs and produced asepsis in rabbits, being the only bacillus in the diphtheria group that causes a general infection after local inoculation in rabbits. Morphologically and culturally it belongs to the pseudodiphtheria bacilli.

Actinomycelial growth form of B. diphtheriae. Spirig⁴ found that when a large number of cultures of *B. diphtheriae* are allowed to stand for a long time actinomycelial growths in the form of chalky deposits are likely to appear in some of the colonies, which originally seemed to be purely bacillary. This he regards as a further stage of development of the bacilli. Subcultures on Löffler's serum gave rise to a dense mycelial network; in bouillon and agar the threads multiply as bacilli and short filaments; on eggs, gelatin, and also often on agar and potato coccoid bodies are formed, which either multiply as such or form short threads and bacilli. Gram's stain positive; tubercle stain negative, also special spore stains. Aërobic growth is better than anaërobic; non-pathogenic for animals. Complete reversion to the type of the original cultures could not be secured, but in bouillon, egg, and agar non-virulent bacilli of the diphtheria type are often seen. Spirig regards his observations as clearly demonstrative of a genetic relationship between the ray fungi and the diphtheria germ, believing firmly that all contamination of his original cultures may be excluded. Further observations are needed to establish these conclusions.

¹ Centralbl. f. Bakt., Abth. I., 1900, xxviii., 136-143.

² Transactions of London Pathological Society, 1900, li., 13, 14.

³ Archiv. f. Dermat. u. Syph., 1899, l., 71.

⁴ Centralbl. f. Bakt., Abth. I., 1899, xxvi., 540, 541.

Diphtheria in Horses. Cobbett¹ describes what seems to have been a genuine diphtheria in a pony, *B. diphtheriae* being grown from the nasal discharge. Subsequently symptoms of laryngeal diphtheria appeared. The susceptibility of some horses to toxin and the presence of antitoxin in many horses' blood suggest that diphtheria may be common among these animals.

LOCAL ACTION OF DIPHTHERIA TOXIN AND ANTITOXIN. Sélinow² studied the action of diphtheria toxin and antitoxin when injected into the substance of the cornea (rabbits). The injection of toxin alone produced an acute inflammation with suppuration, which sometimes extended to the surface of the membrane; marked nuclear changes were observed. The injection of antidiphtheritic serum was followed by a lively cell proliferation on part of the corneal cells and some leucocytic infiltration. The injection of normal horse-serum and of normal salt solution did not produce such marked changes by far. The injection of serum followed ten minutes later by toxin, or *vice versa*, showed always the changes characteristic of the substance last injected. The injection of a previously prepared mixture of toxin and antitoxin in such proportions that the toxin was neutralized produced no changes. Incomplete neutralization gave lesions peculiar to the toxin; an excess of serum gave the lesions peculiar to serum; in both cases the lesions were of slight extent; even when the antitoxic serum was added in such small quantities that no trace of free serum existed in the mixture, there was distinct evidence of cell stimulation. This fact is interpreted by Sélinow as indicating that in the mixture each substance retains in a measure its own property and that the theory of neutralization *in vitro* is not tenable.

Globulins and Antitoxins. Hiss and Atkinson³ showed that the diphtheria antitoxin in the blood-serum of the horse is precipitated with magnesium sulphate. There is some antitoxin in serum of non-immunized horses. Magnesium sulphate precipitates give all reactions characteristic of globulins, and antitoxic power probably resides in newly formed globulins. It was found, further, that all antitoxic power of normal and immune serum is carried by globulin and fractional precipitates thereof. Antitoxin is consequently a form of globulin (Atkinson⁴).

Tuberculosis, its Germ and Allied Organisms. **TUBERCULOUS TOXINS AND TISSUE LESIONS.** Auclair⁵ brings forward evidence that sclerosis in tuberculosis is produced by a different poison from that

¹ Lancet, 1900, 11.

² Archives des Sciences Biologiques, 1899, vii., 356.

³ Journal of Experimental Medicine, 1900, iv., 47-66.

⁴ Ibid., 67-76.

⁵ Arch. de Méd. exp. et d'Anat. path., 1900, xii., 189-202.

which causes caseation. When ethereal and chloroform extracts of the bacillus tuberculosis are injected subcutaneously in guinea-pigs, abscesses result; the one produced by the chloroform extract is less in extent, and becomes encapsulated. The injection of chloroform extract into the trachea produces epithelial desquamation, congestion, and cell proliferation; after four or five weeks areas of induration result; the alveoli contain cells, among which are giant cells; eventually there appear areas of scar tissue containing cavities lined with cubical or cylindrical cells—modified alveolar spaces. Areas of caseation do not occur. These changes resemble greatly certain interstitial changes in the phthisical described by Cornil.¹ This interstitial pneumonia with giant cells is the opposite of the caseous pneumonia that follows injection with ethereal extract.

Auclair regards the fibrocaseous changes in tuberculosis as the result of two distinct poisons; under the various circumstances surrounding the bacillus in the body, it produces now one, now the other, in excess; and according as the caseating or the proliferative toxin predominates so will the lesion vary. It seems to me that it would be difficult to distinguish between the proliferative changes that represent healing processes and those the result of a special toxin.

MIXED INFECTION IN PULMONARY TUBERCULOSIS. Sata² made bacteriological and histological examinations of twenty-one cases, with clinical records, in order to establish the influence of mixed infection upon the exudate and necrobiotic processes. In twelve cases pronounced mixed infection was found; streptococci predominated in six; in four pneumococci; in one staphylococci. Other bacteria were isolated also; diphtheroid bacilli, one of which is called "*pseudodiphtheria bacillus pulmonalis*" because of cultural peculiarities, the colon bacillus, capsulated bacilli, bacillus lactis aërogenes, etc., but these probably did not co-operate in producing the lesions. Sata lays stress upon the number of the different organisms and their situation in the lesions in his estimate of their pathogenic rôle. The observations of Sata would have gained still further in value had he also studied bacteriologically the other organs and the blood of his cases.

It seems well established that in pulmonary tuberculosis bacteria other than the tubercle bacillus may localize first in existing cavities; their toxins may act not only on the surrounding tissues, but also on the whole body; disintegration of the walls may be caused, and with or without the co-operation of the tubercle bacillus a pneumonia may arise in the vicinity. Through aspiration bronchopneumonia foci may de-

¹ Bull. et Mém. de la Soc. Anat., 1899, 29.

² Ueber die Bedeutung der Mischinfektion bei der Lungenschwindsucht; III. Supplementheft, Ziegler's Beiträge, 1899.

velop in other and healthy parts of the lungs. Toxaemia and general infection may result. Mixed infection generally presents itself as a pneumonia of varying extent in the lesions of which streptococci, staphylococci, or pneumococci are found by histological methods in large numbers together with, but also without, tubercle bacilli. It is important to note that mixed infection generally takes place after disintegration of the purely tuberculous tissue begins. Only closed cavities remain free from other bacteria for a longer time.

The so-called phthisis is probably a pure tuberculosis only in the beginning; when advanced there is mixed infection and a large part of the destructive phthisical changes are the result thereof.

Ophüls¹ also studied the pneumonic complications in phthisis. The general conclusions reached are the same as Sata's, both agreeing in the main point, namely, the importance of secondary and mixed infections in the development of destructive lesions in the phthisical lungs. The importance of mixed infection in pulmonary tuberculosis merits much attention from the therapeutic side. Sata did not find pure cultures of tubercle bacilli in open cavities as frequently as Ophüls, who found them in pure growths in seven of twenty-six cavities in thirteen cases. The other cavities contained mixtures of tubercle bacilli and other bacteria; streptococcus in one case; pseudodiphtheria bacilli in five cases; pneumococci in six cases; pneumococci and pseudodiphtheria bacilli in four cases; staphylococci and streptococci in two cases; pneumococci and staphylococci in one case. Ophüls encountered a number of pneumonic lesions in which tubercle bacilli only were present. Simple tuberculous infection and mixed infections may occur in close proximity.

GENESIS OF MILIARY TUBERCULOSIS. In seventeen cases of acute miliary tuberculosis studied by Benda,² the points of invasion of the blood occurred through the thoracic duct twelve times, the pulmonary veins four times, the thoracic aorta once, and from localization of bacilli upon the aortic and mitral valves each once. Heretofore the development of vascular foci has been regarded generally as the result of a tuberculous periangeitis, but in Benda's series it concerned metastases on the intima or the endocardium, in which the bacilli multiplied freely and were later thrown into the circulation. Endovascular tubercles may be small, but intimal tubercles with thrombotic deposits may give rise to larger nodular formations with smooth surface, sometimes several centimetres long. Such cases in the aorta, undoubtedly of intimal origin, are described by Benda³ and Aschoff.⁴ The foci may be moulded by the current in the same way as thrombi, and it may be difficult to

¹ The American Journal of the Medical Sciences, 1900, cxx., 56.

² Berl. klin. Wochenschr., 1899.

³ Verh. Path. Gesellsch., 1900, ii., 335-345.

⁴ Ibid., 419-421.

recognize their tuberculous nature from naked-eye appearances. In addition to typical tuberculous proliferations and caseous material, there is more or less trabeculated hyaline material, especially on the free surface; colossal masses of bacilli may be present directly under the blood stream, yet the surface may be smooth and glistening. Hence the importance of such foci in the development of miliary tuberculosis. It seems as if the thrombotic material serves as an excellent culture medium for the bacilli, which appear to multiply here in the same manner as on artificial media. I can confirm the last observation from the study of an interesting case of tuberculous pericarditis in a dog in which a peri-aortic focus destroyed the wall of the aorta and caused a small aneurism; in the thrombotic deposits on the intimal surface huge bacillary tresses were found like those in cultures.

NEW ACID-PROOF BACILLI AND FURTHER STUDIES IN THIS GROUP. Alfred Möller has described two new organisms which belong to the group of the tubercle bacillus.¹ He now² describes another of this kind, the grass bacillus No. 2, which he found in barn-dust. It forms rods in fluid media, and is morphologically and tinctorially like the tubercle bacillus. After four or five days in solid media long threads, which present true branchings, form in addition to rods and coccoid bodies. These also stain like the tubercle bacillus. In the cultures where rods form principally the arrangement resembles very much that of the tubercle bacillus. In milk the rods and threads present more deeply-stained coccoid bodies in their interior. The organism is pathogenic to guinea-pigs, the organs presenting the picture of a tuberculosis; in the caseous lesions are enormous numbers of bacilli. Histologically the process also resembles tuberculosis. While engaged in this investigation the author for a time felt sick with sore-throat; in the small clumps coughed up he demonstrated the grass bacillus, showing that such organisms which so much resemble tubercle bacilli may be of importance from the stand-point of differential diagnosis.

In the contents of a purulent ovarian cyst discharging through the rectum Dietrich³ found a bacillus which probably entered the cyst from the intestinal contents, and which resisted decolorization by acids and stained with the Ziehl-Nielson method. Tuberculosis was not produced by animal inoculations, and, as far as recognizable, there was no tuberculosis in the patient. Hence we have here another instance of an acid-proof bacillus which shares tinctorial peculiarity with the tubercle germ.

Finkelstein⁴ found acid-proof bacilli in the stools of nurslings. The

¹ PROGRESSIVE MEDICINE, March, 1899.

² Centralbl. f. Bakt., Abth. I., 1899, xxv., 369-373.

³ Berl. klin. Wochenschr., 1899.

⁴ Deutsche med. Wochenschr., 1900.

smegma bacillus and its peculiarities and significance are presented well by O. A. Dahms.¹

Marzinowsky,² in studying the bacterial contents of the tonsillar crypts,³ found an acid-proof bacillus that greatly resembles *B. tuberculosis*.⁴ This bacillus seems fairly frequent in the crypts of the tonsils (five times in twelve cases). He succeeded in obtaining it in pure culture. The growths on potato are quite characteristic—dry, white, folded layers. The bacillus is polymorphous and stains by Gram's method and also with the Ziehl-Gabbett method, though rather irregularly with the latter, some bacilli staining well, others losing their color. Later the author recognized a similar bacillus in the sputum of a patient with bronchitic symptoms, and comparison of pure cultures showed it to be the same bacillus as the one obtained from the tonsils.

Rabinowitsch⁵ succeeded in cultivating an acid-proof and alcohol-proof bacillus from the sputum and from the gangrenous material in a case of pulmonary gangrene. It is probable that this organism is identical with those described by Zahn, Fränkel, and Pappenheim in the sputum of similar and other cases. The bacillus is thicker and longer than the tubercle bacillus; some forms may be shorter, presenting a clubbed swelling of one end; short threads are occasionally seen. A similar organism has been isolated from the surface of the tonsils. The cultures resemble those of other acid-proof bacilli obtained from butter and grass; and Rabinowitsch regards all members of this group as closely related.

HISTOLOGICAL LESIONS OF ACID-PROOF BACILLI OF THE TUBERCULOSIS GROUP. Georg Mayer⁶ finds that pure cultures of many butter bacilli resembling *B. tuberculosis* do not produce specific lesions in the peritoneum in guinea-pigs and rabbits. Butter alone also gives negative results. But the injection of tuberculoid bacilli with butter produced local, encapsulated peritoneal lesions, sometimes ending fatally. The resistance to decolorization by acid and by alcohol is the morphological characteristic of the group, and the plastic peritonitis caused by bacilli mixed in butter the anatomical characteristic. The histological changes are a fibrinous and adhesive inflammation, with accumulation about the bacteria of epithelioid cells which rapidly undergo coagulation

¹ Journal of American Medical Association, April 21 and 28, 1900.

² Centralbl. f. Bakt., Abth. I., 1900, xxvii., 39-45.

³ In a few cases he found organisms not distinguishable from *B. diphtherie*.

⁴ See also Pappenheim, Befund von Smegmabacillin in menschlicher Lungenauswurf, Berl. klin. Wochenschr., 1898, No. 37. Laats, Ueber Tuberkelähnliche Stäbchen in verschiedenen Körpersekreten, Inaug. Diss., Freiburg, 1894.

⁵ Deutsche med. Wochenschr., 1900.

⁶ Virch. Archiv, 1900, clx., 324-358; Centralbl. f. Bakt., Abth. I., 1899, xxvi., 321-336.

necrosis; the bacilli multiply in the form of radiating masses, true branches develop, and clumpy masses form surrounded by polynuclear cells.

According as the virulence of the organisms vary, the bacilli multiply and nodules of new cells develop, followed on the one hand by destruction of the bacteria and cicatrization, and on the other by progressive growth of the bacteria and caseation. Grassberger¹ obtained results similar to those of Mayer.

Koch's bacillus, which when mixed with butter acts much like the forementioned bacilli, is, says Mayer, the only one that alone has the power to induce typical tuberculous lesions; but to this statement Korn's bacillus certainly forms an exception.

Herbert,² studying the question of tubercle bacilli in butter, describes similar changes after the injection of butter into the abdomen of guinea-pigs, but he found it difficult to demonstrate the acid-proof bacillus present. The bacillus alone, however, also produced a nodular disease, but not of a typical miliary character either macroscopically or histologically.

MYCOBACTERIUM LACTICOLA FRIBURGENSE. Otto Korn³ describes a new acid-proof bacillus obtained from nodules in the liver and elsewhere in the abdominal cavity, produced by injecting butter. It resembles *B. diphtheriæ* rather than *B. tuberculosis*, but resists decolorization with 10 per cent. nitric acid alcohol for three minutes. A distinguishing characteristic wherein this organism differs from other acid-proof bacilli isolated from butter is absence of growth in gelatin stab-cultures at room temperature. It grows well in milk. It is harmless for white mice. In pigeons and chickens a necrotic area develops at the site of injection, in which the bacilli persists for a long time. Guinea-pigs and rats acquire a tuberculiform disease of the mesenteric glands after intraperitoneal injection, and local abscesses after subcutaneous, the internal organs remaining healthy in both cases. In rabbits a series of changes in the internal organs macroscopically and histologically like those of tuberculosis develop after both subcutaneous and intraperitoneal injections.

Sata⁴ has shown that in comparison with other bacteria the amount of fat is greater in a number of acid-proof bacilli; it is by virtue of their fat that they withstand decolorization by the methods used in demonstrating the presence of the tubercle bacillus, thus acquiring importance from the stand-point of differential diagnosis.

¹ Münch. med. Wochenschrift, 1899, Nos. 11 and 12.

² Arb. a. d. Path. Anat. Institut zu Tübingen, 1899, iii., 207-228.

³ Centralbl. f. Bakt., Abth. I., 1900, xxvii., 481-486.

⁴ Centralbl. f. Allg. Path. u. Path. Anat., 1900, xi., 97-102.

Klein¹ calls attention to the fact that young tubercle bacilli may be easily decolorized by the acid solutions in common use for that purpose.

IMPROVED CULTURE MEDIUM FOR B. TUBERCULOSIS. Hesse claims that the addition of Nährstoff Heyden (a proprietary product) to agar or glycerin-agar, in place of peptone, makes a medium upon which B. tuberculosis grows with such rapidity that one, two, or three days show distinct increase. This he found especially marked as regards bacilli in sputum. These results are confirmed in a general way by Ficker² and Römer.³ They believe, however, that the rapid growth of bacilli from sputum is greatly furthered by the flocculi of mucus in which the bacilli are confined. Jochmann⁴ and Sondern⁵ also corroborate Hesse's statements. C. Fränkel⁶ adds various improvements to the method; he finds that the growth on the new medium is not quite as rapid as on glycerinated blood-serum.

Ray Fungi. OOSPORA PROTEUS (ACTINOMYCES PROTEA). Schürmayer⁷ describes a new variety of ray fungus, isolated from a process resembling tuberculosis, in the bones of the human foot. He names this fungus oöspora proteus or streptothrix proteus (actinomyces protea is preferable). The fungus is a branching one, forming spores in old fluid cultures only and in the bodies of mice. On solid media short rods, segments, chains of cocci and irregular involutionary forms occur. In the lesions are found segments, long, branched threads and clubs. Many short threads and globular bodies are said to have active movement. It does not stain by the tubercle stain, but takes Gram's stain, warm gentian-violet, and carbol fuchsin. For section, carbol methylene-blue is the only suitable stain, grows best aërobically, and but slowly and scantily anaërobically. Optimum temperature is 37° C. On gelatin and agar plates the fungus forms superficial, gray, iridescent layers, often with fine hairy outgrowths; the deep colonies are not characteristic. In stabs there is a superficial rosette with nodular surface, covered by fine threads; along the stab fine side branches may form. Streak cultures give continuous white or yellowish-white layers with pearly or feathery margins (agar); a heaped-up mass may form. Gelatin is slowly liquefied. In glycerin bouillon a wavy, dry surface layer appears; when submerged it forms sand-like masses which arrange themselves concentrically and assume various colors. On potato there

¹ Centralbl. f. Bakt., 1900, xxviii., 111-114.

² Ibid., Abth. I., 1900, xxvii., 504-511.

³ Ibid., 705-709.

⁴ Münch. med. Wochenschrift, 1900.

⁵ Medical Record, 1900.

⁶ Hyg. Rundschau, 1900.

⁷ Centralbl. f. Bakt., Abth. I., 1900, xxvii., 49-61.

grow grayish-blue, feathery or terraced layers. The colonies otherwise are usually yellowish; old media become brownish. In addition to forming spores within fine threads, more highly developed spores, according to the type of oidia, also develop. It is pathogenic for smaller animals, such as mice, causing a fatal "pseudotuberculosis" and septicaemia.

From its localization Schürmayer's case constitutes an intermediate form between ordinary actinomycosis and Madura foot.¹

ACTINOMYCES CAPRÆ SILBERSCHMIDT. This fungus was isolated by Zschokke from the lungs of a horse supposed to have tuberculosis, and subsequently studied and described by Silberschmidt.² It is composed of thin, undulating threads, more or less ramified and easily broken up into bacillary forms; the cultures, which grow readily in the air (no anaërobic growth), are of a bright, rosy-brown color, and become covered by a white powder; non-liquefying; does not coagulate milk; develops readily on potato; forms thin, distinct, discoidal colonies on the surface of bouillon, or white, dry, spherical colonies, but no continuous surface film, while in the depth of the medium there is either a granular deposit or small spherical colonies. On agar the colonies are either dry, prominent with flattened centres and a warty or folded surface, or, at other times, white, hemispherical, and velvety. It is pathogenic for rabbits and guinea-pigs, producing either abscesses or tuberculiform nodules, with giant-cells, caseation occurring rapidly. It stains best with carbol fuchsin, anilin-water-gentian-violet, and Gram's method, being harder to stain well in the tissues than in the culture, double-staining with eosin and Gram's method giving best results in sections. It is not stated whether it is acid and alcohol proof or not, but judging from the lesions it produces it would seem quite likely that it belongs to the group of acid-proof ray fungi.

George Dean³ obtained a ray fungus from the contents of an abscess over the angle of the jaw of a horse. This fungus does not grow on potato, gelatin, or blood-serum. In rabbits it produces nodular lesions with characteristic filamentous rosettes. It grows in bacillary form on agar, and better aërobically—characters that suffice to differentiate the organism from other ray fungi.

ACTINOMYCELIAC DACRYOLITHS. Silberschmidt⁴ describes two new cases of fungous concretions in the tear ducts, diagnosed as actinomy-

¹ For a further consideration of ray fungi, see *PROGRESSIVE MEDICINE*, March, 1900, and Hektoen, *Chicago Medical Recorder*, 1900, xviii., 425-453. For staining ray fungi with Sudan III., as recommended by Sata, see page 327.

² *Ann. de l'Inst. Pasteur*, 1899, xiii., 841-853.

³ *Transactions of the London Pathological Society*, 1900, li., 26-47.

⁴ *Centralbl. f. Bakt., Abth. I.*, 1900, xxvii., 486-493.

cosis of the lower ducts; he was fortunate enough to obtain the organism in pure culture. The concretions in the first case consisted of minute yellow kernels composed of fine threads and detritus; clubs were not present; true branching was observed; Gram's stain was positive. Gelatin was slowly liquefied; yellowish or whitish clumps formed in bouillon; there was little or no growth on the surface of agar and potato, but in the depth of agar pin-head sized, roundish, firm colonies formed. Transplantations frequently failed. The fungus grew better anaërobically than aërobically, and appeared as pleomorphic organisms, resembling at times the diphtheria bacillus, at other times assuming the form of threads, with irregular swellings and branches, and then again appearing as chains of oval cocci. Subcutaneous and intra-peritoneal inoculations in guinea-pigs produced local foci of suppuration, but the pathogenicity was slight. Rabbits appeared wholly refractory.

In the second case cultures of a somewhat similar but non-pathogenic fungus were obtained from the concretions after they had been preserved in a corked bottle for six months.

We have here examples similar to those already described by v. Gräfe, v. Schroeder, Elschnig, and Fuchs—none of whom obtained cultures—of the lodgement in the tear-duct and subsequent growth of certain little understood ray fungi which presumably lodge upon the conjunctiva from the air.

BACILLUS PSEUDOTUBERCULOSIS MURIUM (*ACTINOMYCES MURIUM*). As pointed out by Dorothy M. Reed,¹ there are various organisms concerned in the production of nodular ("pseudotuberculous") diseases in animals, to which rodents seem especially liable. Dorothy M. Reed describes an organism of this class, originally isolated from spontaneously diseased mice by Welch in 1894 and identical with the organism described by Kutscher² in 1896. Injections of pure cultures reproduce the disease in mice, but with certainty only when inoculated into the abdominal and pleural cavities. The nodules of the disease differ from the nodules of other similar diseases in being made up largely of colonies of the organisms and only to a small extent of the body cells. The organism occurs in the form of rods and of branching bodies, the branching occurring both in the body and the cultures. Forked and Y-shaped forms are present, and irregular, twisted forms occur in old cultures. Its cultures are much like those of *B. diphtheriæ*. The gross appearances of the colonies in the tissues are somewhat similar to those of the granules of other pathogenic ray fungi, to the polymorphous

¹ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 525-542.

² Zeitschrift f. Hyg. u. Infektionskr., 1894, xviii., 327.

group of which this organism, which I have taken the liberty to designate as *actinomyces murium*, would seem to belong.

BACILLUS (ACTINOMYCES) ACNES. In the course of his studies of the bacteriology of vesicular and pustular lesions of the skin, Gilchrist¹ isolated a peculiar bacillus from the pustules of *acne vulgaris*. The original growths were secured by placing directly upon the media the pus of the pustules, especially the whitish clumps often found in the pus. The bacillus grows in a white, soft, elevated mass, with moist, smooth, and glossy surface and a regular margin. Transplantation of the clumps of the growths give rise to subcultures. Growths were obtained in glycerin-agar, blood-serum, glucose-agar (no gas), and bouillon, but not in gelatin, milk, or Dunham's solution. Old glycerin-agar cultures may assume a pinkish tinge, after a time turning almost black.

The bacillus is a short, thick one as seen in smears of the pus, often staining irregularly. In older cultures branching threads develop. It stains by Gram's method, and is possessed of slow motion. The organism produces suppurative lesions in guinea-pigs and mice.

The diphtheria bacillus and tubercle bacillus often show branching forms, and as long as they are classed with bacteria Gilchrist would also for the present place his organism among these bacilli. On account of the frequency of *acne* and the number of its lesions, the bacillus *acnes* will probably come to enjoy the distinction of being the most frequent pus producers in cutaneous diseases.

The skin evidently harbors a variety of bacilli, some of which occur in branching forms. Recently Nakanishi² found a bacillus of this kind in pustules of *vaccinia* and *variola*. This bacillus is pyogenic. Levy and Finkler³ noted its presence in calves' lymph (*corynebacterium lymphæ vaccinalis*). Nakanishi was inclined at first to regard it as the cause of *variola*, but abandoned this idea on finding that it is constantly present on the skin of man as well as of cattle. In connection with this mention may also be made of the so-called diphtheroid bacilli found by Bordoni-Uffreduzzi, Babes, Levy, Czapelewsky, Spronck, and Baranikow⁴ on or in the skin of leprosy. The bacillus described by Baranikow at times appeared acid-proof. The relations of these and similar organisms would be an interesting study.

THE HYPHOMYCETIC NATURE OF B. GLANDERS. H. Conradi⁵ contributes a research on the hyphomycelial nature of *B. glanders*, based

¹ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 409-430.

² Centralbl. f. Bakt., Abth. I., 1900, xxvii., 641-661; Ibid., xxviii., 304-305.

³ Deutsche med. Wochenschrift, 1900, No. 26.

⁴ Centralbl. f. Bakt., Abth. I., 1900, xxvi., 113-114.

⁵ Zeitschrift f. Hyg. u. Infektionskr., 1900, xxxiii., 161.

on a study of a non-pathogenic but culturally typical race of organisms, which grew to form branching threads full of round and oval unstained areas of varying size. These vacuoles he regards as the result of normal growth rather than a degenerative phenomenon. There was a delicate membrane surrounding the threads, and the branching was typical, monopodial, beginning with the outgrowth of a small, rounded elevation at the side of the thread. Metachromatic granules did not seem to have anything to do with the formation of the branches. As is the case with other organisms that resemble *B. glanders*, the addition of glycerin influences its growth favorably. Occasionally the free ends would assume the form of clubs. The implantation into the peritoneum of guinea-pigs of cultures on blood-serum of this animal in collodion sacs gave rise to growths composed of bacillary and bizarre forms, but not of threads with branches. There are thus many points of resemblance between *B. glanders* in its more saprophytic form and the ray fungi; organs of fructification are, however, absent, so that at present *B. glanders* is best classed with *B. tuberculosis*, *B. diphtheriæ*, and other bacteria, and these organisms constitute an important connecting link between the bacteria and fungi. Bruno Galli-Valero¹ also describes clubbed, branching, and bizarre forms of *B. mallei*.

Pathogenic Oidia and Blastomycetes. DISTINCTION BETWEEN OIDIA AND BLASTOMYCETES. Guiseppe Cao² reviews the literature bearing on blastomycetes and on the closely related organisms, the oidia. He isolated from fruits, pathological products, detritus, etc., forty-one different cultures of oidia, which he studied in various ways. They are widely distributed organisms, and may be isolated from a number of substances. Oidia, saccharomycetes, and blastomycetes have been mixed by the late authors. Cao would separate all those organisms of this general group that multiply by budding and form at the same time mycelial threads in cultures into a distinct class—that of oidia—which would stand midway between blastomycetes proper and hyphomycetes. This plan would throw many of the pathogenic blastomycetes described of late, especially from blastomycetic dermatitis, among the oidia (oidiomycetic dermatitis), because of the formation in culture media of mycelium—a property rarely observed in the lesions. This, again, would involve a change in the names of the diseases thus produced. The question is probably not yet ripe for settlement, though strictly speaking nearly all the organisms so far isolated have been oidia and not blastomycetes. In addition to *oidium albicans* and *oidium lactis*, Cao isolated thirty-nine other forms (many probably identical); these he divides into four more or less distinct groups according to

¹ Centralbl. f. Bakt., Abth. I., 1900, xxviii., 353–359.

² Zeitschrift f. Hyg. u. Infektionskr., 1900, xxxiv., 239–282.

cultural peculiarities. The majority are pathogenic, presenting (1) pyogenic, (2) granulomatous, and (3) toxic properties. The literature is given fairly well.

Pathogenic Yeasts. Alexander G. R. Foulerton¹ made inoculations with various yeasts. In one series of experiments the following were used: *S. cerevisiæ*, *S. pastorianus* 1, 2, and 3, *S. ellipsoideus*, *S. albus*, *S. albus liquefaciens*, *S. anomalous*, *S. albicans*, and a red yeast from feces. In most of the animals death resulted after from a few days to three weeks or more, and in many cases granulomatous swellings developed at the site of the inoculation, from which the yeasts were again cultivated. It was found difficult to identify the organisms in the sections, as no morphological distinction could be made out between one species of yeast and another.

The principal part of the paper is taken up with the study of a pathogenic yeast isolated from the two cases of pharyngitis. This yeast is called the *saccharomyces tumefaciens albus*.

S. TUMEFACIENS ALBUS never forms mycelial threads in cultures; it multiplies by budding and presents a vacuolated protoplasm, containing fat and glycogen. Every cell has a highly refractile nucleus. It ferments glucose energetically, maltose less rapidly, and lactose not at all. It grows well in ordinary media and stains by Gram's method. It is pathogenic for rabbits, guinea-pigs, and tame mice, producing on subcutaneous injection accumulations of leucocytes and large tissue cells. The organism is readily recultivated from these nodules; it is much more easily recognized in freshly teased specimens than in fixed and stained sections; Gram's stain, Löffler's methylene-blue solution, and a 1 per cent. aqueous solution of methyl-violet were most useful. Löffler's solution stained the yeast cells reddish, methyl-violet a rich purple; but there was always more or less difficulty in clearly bringing out the organisms because of loss of characteristic shape, of degenerative changes, and because of the affinity of the nuclei of the cells for the stains. "Pseudomycelial" bands of short chains of elongated cells were sometimes observed.

SACCHAROMYCES GUTTULATUS is another interesting blastomyces which was first described by Remak in 1855. According to Casagrandi and Buscalioni,² it is the one organism of its kind that can live in the intestinal canal of mammals. These authors isolated it from the stomach and intestines of rabbits. When in the intestine its protoplasm contains glycogen. It forms alcohol from glucose and inverts saccharose.

¹ Journal of Pathology and Bacteriology, 1899, vi., 37-63.

² Annali d'Igiene sperimentale, viii.; Abstract in Centralbl. f. Bakt., Abth. I., 1898, xxiv., 757.

It produces nodules containing pus when inoculated into rabbits, guinea-pigs, and rats, and, after a long time, death.

SACCHAROMYCES RUBER was isolated by Casagrandi from diabetic urine; it produces small nodules with purulent contents similar to those produced by the oidian forms.

SACCHAROMYCES GRANULOMATOUS, named by Sanfelice,¹ is a non-liquefying, gasogenic saccharomyces isolated from nodules in the lungs of a swine. It is pathogenic only for swine and produces granulomatous nodules, containing giant cells, in which the parasites often become calcified.

EXPERIMENTS WITH BLASTOMYCETES. Stoewer² has studied experimentally the action of pathogenic yeasts upon the rabbit's eye. He used a red yeast isolated from a case of human keratitis and also the blastomycetes of Busse and of Curtis. They produced inflammations in the anterior chamber and the iris, opacities and other changes in the lens, and tumor-like swellings in the subconjunctival tissue. Whether the yeasts play any rôle in the diseases of the human eye is a question for future study. No importance is to be attached to previous studies of the morbid changes of the eye in this respect, because yeasts are so hard to distinguish in stained preparations, those that stain resembling fully the nuclei of tissue cells.

Wlaeff³ states that he has been able to exalt the virulence of pathogenic blastomycetes (not more closely specified) by repeated passages through the animal organism. By means of inoculations with cultures rendered more virulent in this way he produced a septicæmia in some animals, in others tumor-like swellings and cystlike cavities, and in the guinea-pig there also developed a cutaneous lesion, which the author calls *pseudolupus vulgaris*. Wlaeff obtained a feeble toxin, 30 to 50 c.c. of which killed rabbits in nine or ten days and 15 to 30 c.c. of which killed guinea-pigs in the same time. He also succeeded in obtaining a certain degree of immunity and an antitoxic serum. Blastomycetes did not grow in the serum of immunized rabbits.

Weinberg⁴ found that the local swellings produced by feebly virulent blastomycetes most often appear as cysts, the contents of which consist largely of degenerated organisms enclosed in a capsule of inflammatory origin; intraperitoneal injection produced marked subacute inflammatory thickenings in which, as well as in the metastatic foci, there occurred a marked multiplication of the organisms; in no case did

¹ Zeitschrift f. Hyg. u. Infektionskr., 1898, xxix., 463-501.

² Centralbl. f. Bakt., Abth. I., 1899, xxvi., 234; Arch. f. Ophthalmol., 1899, xlviii. 178.

³ Bull. et Mém. de la Soc. Anat. de Paris, 1899, lxxiv., 706.

⁴ Ibid.

there develop formations which could be classed as carcinoma or sarcoma.

Wlaeff and Weinberg¹ describe the histological lesions produced by the yeasts of Curtis and of Sanfelice in animals. In the septicæmias which result from subcutaneous injections of rats and of guinea-pigs all organs are hyperæmic, and in many places, especially in the glomeruli of the kidney, the capillaries dilated on account of accumulation of organisms. Organisms are also found in the vessels in animals which die later from cachexia following the formation of a series of granulomas in different organs.

Subcutaneous injections of rats and guinea-pigs with a small quantity gives rise to swelling, which in two to four weeks acquires the size of a large nut or hen's egg; at first firm, the swellings soften in the centre, and finally ulcerate; in the meantime metastases form. In the early stages the nodules consist of new-formed connective tissue, in which lie the organism. As central softening develops leucocytes accumulate. At times nodules develop far from the point of primary inoculation; when such swellings ulcerate the lesions often assume a lupoid aspect. Metastatic nodules, similar in structure to the subcutaneous, may develop in all the organs.

Intraperitoneal inoculations produce a general peritonitis, with small, grayish nodules. Inflammatory changes also develop over the subserous nodules in the liver and spleen.

In the chronic infection fatty changes occur especially in the kidney and the liver; occasionally necroses are found in the liver. Acute nephritis also occurs. In the lungs a veritable pneumonia may be found, and in such areas the smaller vessels and capillaries are literally crowded with leucocytes; organisms are found in the alveoli, some of which are filled with them. The subcutaneous and intraparenchymatous tumors produced by the yeasts of Curtis, or of Sanfelice, do not resemble in structure either carcinoma or sarcoma; they are simply areas of inflammatory granulation tissue.

Wlaeff emphasizes the necessity of fixation in Flemming's solution in order to obtain good stains of organisms.

In a large number of experiments with various forms of blastomycetes in different kinds of animals (using in all some five hundred animals), Wlaeff,² in summarizing his observations, states that the organisms change their virulence and appearance in different animals; the organisms may produce septicæmia, acute nephritis, pneumonia, abscesses, skin lesions, and primary nodules with metastases. The

¹ Bull. et Mém. de la Soc. Anat. de Paris, 1899, lxxiv., 842.

² Ibid., 1900, lxxv., 147.

nodules may have a granulomatous or adenomatous structure. The adenomatous formations, sometimes distinctly papilliform, were held by Cornil and others as true experimental tumors, the question deserving further study. Brault, on the other hand, referred to the similarity between the growths obtained by Wlaeff and the lesions of coccidiosis, in which there is a proliferation of the connective tissue as well as of the epithelium; and Letulle pointed out that in intestinal tuberculosis and other human lesions quite similar "glandular epitheliomas" are seen.

PHAGOCYTOSIS OF BLASTOMYCETES. Since the demonstration of the existence of pathogenic blastomycetes the question of their fate in the organism has been studied by several investigators. Gilkenet and Sona claimed that they are destroyed by the actions of the serum and other body fluids; Schattenfroh placed more stress on phagocytosis, and recently Skchiwan,¹ who made use in his experiments of *saccharomyces subcutaneous tumefaciens* Curtis, *saccharomyces pastorianus*, and a red yeast, concludes that the destruction of pathogenic as well as non-pathogenic yeasts is accomplished by the digestive powers of the leucocytes which take up the living organisms and destroy them. Skchiwan was able to demonstrate the multiplication within the phagocytes of yeasts; and *saccharomyces pastorianus* grows well in sterile tubes open at one end and introduced subcutaneously in rabbits and guinea-pigs as well as in collodion sacs placed in the abdominal cavity of rabbits. It is, therefore, concluded that the destruction of yeasts takes place in accord with the general laws of phagocytosis. In the case of pathogenic yeasts which survive and multiply in the body it may be assumed that they produce substances which paralyze the actions of the cells; the formation of a capsule commonly seen in pathogenic yeasts in the lesions they produce is also regarded as a means of defence, by virtue of which the organisms resist the leucocytes, even when these band themselves together and form multinuclear giant cells—a phenomenon which Skchiwan observed from its onset in the peritoneal and pleural exudate as well as in the subcutaneous tissue.²

GENERAL PATHOLOGICAL HISTOLOGY.

Regenerative and Other Cellular Processes. Adami writes an interesting article in Jacobi's *Festschrift* (pp. 422-432) on the relation between cell differentiation and proliferative capacity and its bearing

¹ Ann. de l'Inst. Pasteur, 1899, xiii., 771-778.

² A new pathogenic mould. Ophüls and Moffatt make a preliminary report (Philadelphia Medical Journal, June 30, 1899) of a case of general infection with a spore-forming mycelial organism, which they isolated in pure culture. Further reference will be made when the final report appears.

upon the regeneration of tissue and the development of tumors. He lays down the following laws :

1. The fully differentiated cells of a tissue proper never arise from cells that are themselves fully differentiated.

2. Under the normal conditions of growth and during physiological regeneration the fully differentiated cells would seem in nearly every case to be developed from "mother cells"—undifferentiated or but partially differentiated cells, which themselves throughout the term of life of the individual never attain to the full differentiation peculiar to the tissue to which they belong and which, indeed, they produce. For these mother cells by division give origin to the daughter cells, and it is the daughter cells which attain full differentiation and form the specific cells of the tissue. More rarely the functional cells themselves, by reversion to a more embryonal type, take on the properties of mother cells.

3. Under abnormal conditions the fully differentiated functioning cells of certain tissues are capable of proliferation and giving rise to cells of like nature, but this is only after a preliminary reversion to a simpler, more embryonic type. The fully differentiated cell as such is capable of proliferation.

4. Or, otherwise, the energy stored up by the cell may be expended in one or two directions, but not in both—either in functional activity or in preparation for proliferation, and, the structure of the cell being the expression of the activity of that cell, the expenditure of energy in either direction is attended by corresponding morphological or structural differences in the cell.

5. The more highly differentiated the cell, the more highly elaborated its structure, the less the ease with which it reverts and the less the liability to reversion to a simpler reproductive form ; the simpler the cell the greater the ease and the greater the liability to such reversion. It is thus possible to conceive, at the one extreme, cells so simple in function and in structure that functional or reproductive activity may be called into play indifferently, without recognizable preliminary structural alteration, and, at the other, cells so highly differentiated that the capacity for proliferation has become entirely lost.

Regeneration of the Crystalline Lens. Randolph¹ found that in the rabbit regeneration of the lens occurs only when some portions of the lens are left behind at the extraction, the essential element being the epithelium. Vericenzo Colucci, Wolff, and Erik Möller have claimed that in the salamander the lens may be regenerated from the

¹ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 237-263.

epithelium of the iris—*i. e.*, by a process of heteromorphosis, as J. Loeb terms the reproduction of an organ from other tissues than from its own. Loeb¹ has shown that in lower animals contact with different kinds of substances may cause heteromorphosis. In order to test the observations of the fore-mentioned authors, Randolph experimented with a newt or water-lizard, the special point at issue being whether the lens could be extracted without leaving behind epithelial cells from which regeneration might occur. Examination by serial sections of the complete lenses revealed that in the newt extraction of the lens usually brings it out in the unbroken capsule. It was also found that in this animal regeneration of the lens occurs when the lens has been taken out in the capsule, "so that the new lens must take its origin from tissue having a different physiological value," namely, the iris. In this case, then, the law of the specificalness of the cells meets with a noteworthy exception.

Reproduction of Elastic Elements. Weigert's convenient and highly successful stain for elastic fibres has led to a renewed study of these elements under normal and pathological states. Melnikow-Raswedenkow² sees much of an adaptive tendency in the increase of elastic elements observed in various conditions characterized by atrophy of cells, as in old age and in diffuse sclerotic processes. In passive congestion there is also new production of elastic fibres. Under these circumstances the increased elastic elements tend to maintain the equilibrium of the tissues under the changing mechanical conditions and to promote the circulation of blood and other fluids. In functionless scars, replacing tissue that has been destroyed, elastic fibres may be wholly absent. And tumors are generally poor in elastic constituents; being useless structures, he reasons that there is no special necessity for elastic elements. Numerous instances may be cited, however, of the development of elastic fibres in tumors (page 358), and there are undoubtedly other factors determining the formation of elastic material than the element of usefulness from a mechanical view-point.

Jores³ demonstrates by Weigert's method that an increase and regeneration of elastic fibres occurs in the media of arteries in arterio-sclerosis, in thrombo-arteritis, after injuries such as crushing (rabbits), and in veins in thrombo-phlebitis, and after the subsidence of acute phlebitis. In these conditions, as well as in interstitial inflammations, Jores traces the new elastic elements to the pre-existing. In cutaneous scars the regeneration of elastic fibres takes place rather slowly and some time after the granulation tissue has changed to fibrous tissue. In scars the

¹ American Journal of Physiology, 1900, iv., 60-68.

² Ziegler's Beiträge, 1899, xxvi., 546-588.

³ Ibid., 1900, xxvii., 381-406.

result of primary union, elastic fibres develop especially in the lateral and the upper layers, whereas in scars after secondary union the elastic elements are equally disseminated after a few months. The fibres are rather short and pass toward the surface of the skin, forming a network. In all cases the new fibres are in connection with the pre-existing. Old fibres become surrounded with fine processes, which pass in among the bundles of fibrous tissue either as granules or as fine threads. At first the new fibres may not stain blue with Weigert's stain; later the reaction is more perfect. Swellings may appear in the course of the new fibres, and from such swellings fibrillæ emerge; these swellings are not unlike cells, but Jores could not find any nuclei in them. Their exact nature has not been determined. He found numerous nuclei to appear in the course of and in close contact with the old fibres.

Among his conclusions I note:

Elastic fibres appear in proliferating connective tissue only when the latter has become mature.

Elastic fibres develop from the old elastic tissue always present in connective tissue, but in varying amounts.

Mechanical pressure or traction not essential for development of new elastic tissue as shown by its development in thrombo-arteritis, in uterine fibromyomas, obliterated canals in testicles, and transplanted periosteum.

Collagenous fibres can probably not develop into elastic tissue.

Young fibres are stained lighter blue than the old by Weigert's method. The constant, close relationship between new fibres and cells, the persistence of the attachment of fibre to cell, even when the structure is forced apart by artificial œdema, show that cells probably influence growth of fibres. Cells probably change to elastic fibres; but it is hard to trace the early beginning of elastic fibres.

Fischer¹ has studied the elastic tissue in the walls of inflamed, sclerotic, and dilated veins. In acute phlebitis the elastic fibres are pressed apart and then destroyed, either in spots or diffusely. The internal elastic coat resists longest. Extensive regeneration occurs after subsidence of inflammation; at the inner margin of the thrombus a new internal elastic layer forms. In all thrombi the newly formed fibres begin at the external margin and spread out into the interior, even when the lumen is wholly closed; in this case, however, the amount formed is less than under other circumstances. In phlebosclerosis there are new elastic fibres in the media and especially in the intima in association with degeneration in other places. The elastic tissue resists degeneration longest of all elements in the vessel wall, and acts undoubtedly as a protection against the chronic inflammatory process, which, after

¹ Ziegler's Beiträge, 1900, xxvii., 494-554.

all, is the real nature of angio-sclerosis. Varices are regarded as the result of chronic inflammatory processes in the vascular wall, and the condition of the elastic fibres is a variable one indeed.

Woltke¹ has studied the elastic fibres in the uterus and ovary, and Obermüller² those of the vagina.

Plasma Cells and Osteoblasts. Harris³ states that "osteoblasts, tinctorially and morphologically, greatly resemble plasma cells, and, in addition, they likewise seem to originate from lymphoid cells." He further suggests that as osteoblasts secrete bone matrix, so plasma cells may secrete fibrous tissue. These suggestions await further elaboration. Harris also advances the idea that mast cells are mucinoblasts, as the granules in the mast cells react to stains in the same manner as mucin.

Action of Chemical Substances on Leucocytic Emigration. I. Adler⁴ investigated the action of different chemical substances upon the emigration of the different forms of leucocytes, employing cubes of elder pith saturated with different kinds of fluids and inserted into the abdominal cavity of rabbits. None of the substances tested (acid fluids, emulsions of staphylococcus and streptococcus, physiological salt solution, sodic salicylate, 4 per cent. formalin solution, etc.) evinced any special affinity for any single form of leucocyte, the polynuclears constituting the majority of the emigrated cells in all cases. Adler's results are, therefore, corroborative of Borissow's. The greatest emigration of polynuclears was caused by bichloride solutions of 1:3000, the exudation being a pure pus. Formalin, on the other hand, caused comparatively little emigration, the tissue cells, lymphocytes, and plasma cells being relatively much more numerous. Borst⁵ noted the same general action of formalin in his study of the changes induced by fish bladders filled with various substances and introduced into the abdominal cavity.

Toxins, Phagocytosis and Proliferation. Mallory⁶ advances the hypothesis that while strong toxins cause degeneration and necrosis of cells and exudation, weak toxins produce proliferation and phagocytosis. Here phagocytosis means the inclusion and digestion of certain cells by other cells. The facts in favor of this hypothesis are gathered from the study of a large amount of post-mortem material. Proliferation and phagocytosis are prominent changes in the lesions of typhoid fever, as was described by Mallory⁷ in 1898. In diphtheria the diffusion of

¹ Ziegler's Beiträge, 1900, xxvii., 575-585.

² Ibid., 586-590.

³ Philadelphia Medical Journal, April 7, 1900, 757-764.

⁴ International Contributions to Medical Literature, Festschrift in Honor of A. Jacobi, 1900, 309-317.

⁵ Verh. Path. Gesellschaft, 1900, ii., 176-187.

⁶ Journal of Experimental Medicine, 1900, v., 1-13.

⁷ Ibid., 1898, iii., 611-638.

a small amount of toxin through the circulation produces some proliferation of the cells lining the reticulum of lymph nodes, and the new cells incorporate and digest a large number of lymphoid cells. Foci of epithelioid cells were described in the splenic follicles of diphtheria by Bizzozero, Stilling, Oertel, Barbacci, and others. Bizzozero's description is especially complete, and he mentions the presence within the large nucleated cells of two to ten small bodies at times of the size of the nuclei of lymphoid cells. Tatiana Waschkevitch¹ has recently studied foci of this kind, dwelling especially upon the necrotic changes. Mallory also finds that the toxins of the micrococcus lanceolatus, streptococcus pyogenes, and staphylococcus pyogenes may cause marked proliferation, especially of the capsular epithelium of the renal glomeruli. In staphylococcus abscesses in the kidney phagocytosis was pronounced. Reference has been made to the proliferation and phagocytosis in acute lobar pneumonia described by Pratt. In certain places, especially in the meninges and in the lymph nodes, tubercle bacilli may induce a lively proliferation of endothelial cells, which are endowed with marked phagocytic powers. In all these examples of proliferation mitotic figures are found. The new cells, except those in the glomeruli, incorporate leucocytes, lymphoid and plasma cells, and red globules; eventually the included cells are destroyed. Phagocytic cells are amoeboid; in one instance young endothelial cells were seen migrating from lymph vessels into the surrounding tissue. In the kidney and the lung epithelial cells also acquire phagocytic powers. It is also probable that phagocytic cells arise in connective tissue cells; but this is hard to settle, because of the almost universal presence of endothelium. In a peculiar instance of nodules in the urinary bladder these were found composed of phagocytic cells in the lymph spaces of the submucosa; the inclusions were bacilli, often in enormous numbers, and cells (polynuclear leucocytes and lymphoid cells). Mallory also refers to the proliferation of leucocytes in certain infections and of plasma and lymphoid cells in scarlet fever and diphtheria. Marcuse² recently described the lymphomata in the liver in infectious diseases, such as scarlet fever, typhoid fever, measles, and pneumonia. They are accumulations of lymphoid cells, replacing the interstitial tissue, and are claimed to have nothing to do with areas of necrosis, as they disappear gradually without necrosis after the disease has subsided, leading perhaps to some increase in the fixed tissue.

The proliferation here described by Mallory and others may be fraught with harm: lymphatics are blocked; capillaries and veins occluded, so that necrosis results; renal glomeruli may be compressed or

¹ Virch. Arch., 1900, clxx., 137-151.

² Ibid., clxx., 186-202.

occluded from within; emigrating from vessels in the kidney, the lymphoid and plasma cells may proliferate in the tissue around the tubules and cause their destruction (Councilman's acute interstitial nephritis); and the phagocytic activity of some of these cells probably destroys useful cells. It seems to me that this destruction of great numbers of cells would be favorable for the development of antiphagocytic substances or lysins according to principles of cytotoxin formation in general (page 300), but autolysins have not been demonstrable in experiments along that line by Ehrlich and Morgenroth. Ziegler and Weigert regard it impossible to separate inflammatory from regenerative proliferation, while Baumgarten upholds primarily formative stimuli in many inflammatory proliferations, and his contention is certainly favored by the results of Mallory's studies.

Tissue Changes Produced by Cold. As the result of experiments, Kriege claimed that following exposure of living tissue to cold thrombosis develops and leads to necrosis. Uschinsky, on the other hand, described degenerative changes in the cells and tissues as the direct result of the action of cold. Rischpler,¹ in Marchand's laboratory, froze the ears of rabbits, and also other tissues, by the ether spray and maintained the frozen condition for three to four minutes. The tissues were then examined at varying intervals. The mildest degree of injury manifests itself in vacuolation of the protoplasm; more severe alterations consist in loss of staining power and in disintegration of the nuclei. Muscles and nerves also show degenerative changes. The fibrous tissue and the matrix of cartilage become œdematous. Such changes may take place without thrombosis. Regenerative changes appear as early as twenty-four hours after the freezing, associated with the appearance of multinuclear giant cells. Hochhaus² showed that on exposing circumscribed areas of the liver and the kidney to the action of cold, necrosis, calcification, and connective tissue proliferation resulted, associated with the formation of multinuclear giant cells. Fuerst³ found that brief frequent applications of mild degrees of heat and of cold produce great enlargement of the cells and also cell proliferation. Multinuclear giant cells appear early and are formed by repeated amitotic division of single cells, due, it is assumed, to protoplasmic injury, the nucleus remaining normal. Thermal stimuli of this sort in the guinea-pig materially hastens regeneration. Further experiments in this line are indicated as the increased regenerative power thus induced may be found of advantage in clinical surgery.

Degenerative Changes in Muscles. The study of striated muscles

¹ Ziegler's Beiträge, 1900, xxviii., 541-592.

² Virch. Arch., 1898, cliv., 320-334.

³ Ziegler's Beiträge, 1898, xxiv., 415-457.

in chronic affections, heretofore somewhat neglected, has lately received careful attention. Kottman¹ has studied the muscles in extreme emaciation (tuberculosis and cancer), and Fujinami² in leprosy and pyæmia. Both describe peculiar nuclear changes. Many of the nuclei had melted together and appeared as clump-like masses. Some were bent, indented, and in stumps, while others had the appearance of variously sized plates. These nuclear plates at times surrounded one-third to two-thirds the circumference of the muscle fibres. Some of the plates had branches which were united by fine threads to other plates. Others, again, seemed broken up into smaller ones, resembling strings of pearls or large anthrax bacilli running parallel or obliquely to the muscle bundles. Fujinami explains these appearances as due to nutritional disturbances of the muscle from changes in the lymph spaces; many of the nuclei belonged to endothelial cells which suffered similar degenerations.

More interesting, however, are the findings described by Fujinami³ in muscle at the periphery of malignant growths. The nuclei, instead of undergoing the changes described, were largely increased in numbers. The fibres, which had undergone various forms of degeneration, showed flask-shaped appearances—the so-called ampullar atrophy—and the formation of giant cells. Other cellular formation also developed from the changed primitive muscle bundles. There were present all the appearances which are observed in the early development of muscles, giving the impression that regeneration is taking place at the same time as the fibres themselves were undergoing various degenerations. According to Fujinami the degeneration of the fibres results from the infiltration of the tumor cells along and within the sarcolemma sheaths and the blood and lymph channels. This is observed more frequently in carcinoma than sarcoma. In addition to mechanical pressure, Fujinami believes that chemical influences also play a part in the degeneration of the muscle fibres. The production of both coarse and fine granules (first noted by Schaffer) were also observed by Fujinami. In this connection it is interesting to note that Durante⁴ refers similar granules to two distinct conditions: only fibres with coarse granules does he regard as showing a true granular degeneration—a true chemical transformation of the fibres—while the others which have the appearance of cloudy swelling he regards as presenting a simple modification or increase of physiological activity of the sarcoplasm. This condition, when long continued, may then pass into a granular or true degeneration. He therefore divides all muscle lesions into two categories: degeneration and regeneration. In the former the muscle

¹ Virch. Archiv, 1900, clx., 75-84.

² Ibid., 115-158 and 159-172.

³ Ibid., 577-579.

⁴ Bull. et Mém. de la Soc. Anat., 1900, lxxv.

fibres are chemically changed, while in the latter there is a modification of the activity and vitality of the muscle elements.

A. G. Hoen¹ makes a contribution to the study of degeneration of striated muscle as found in the relapsed and elongated uvula. The changes noted have not hitherto been described. The paper is illustrated by a series of masterful photomicrographs. Associated with marked nuclear proliferation there develop "bleb-like deposits" along the margins of the fibres, which ultimately lead to their complete disappearance, the nuclei being found in the centre of the vesicles; later a granular and yellow pigment is deposited around the nucleus, which may show signs of degeneration, and eventually it may disappear.

Embolism of Parenchymatous Cells. With Lubarsch,² embolism of parenchymatous cells—a very interesting phenomenon—may be divided into (a) purely cellular emboli and (b) emboli composed of tissue fragments.

(a) Cellular emboli may be divided into :

1. *Liver Cell Emboli.* These are principally of traumatic origin. Infectious toxic embolism of liver cells probably does not take place nearly as frequently as at first supposed, the cells regarded as dislodged liver cells being giant cells from the bone-marrow (Lubarsch). Lindfors and Sundberg observed liver cells in the pulmonary capillaries in puerperal eclampsia. When death occurs late in the disease or some days after the convulsions it may be quite difficult, if not impossible, to demonstrate embolism of liver cells.

2. *Placental Cell Embolism.* It is difficult to distinguish between placental giant cells and giant cells from bone-marrow. This is discussed later. It was thought that placental cells form emboli only in puerperal eclampsia. Kassjanow, however, observed emboli of placental giant cells in eleven puerperal women; they may occur even before labor has commenced, as, for instance, at the fifth month. The frequent presence of placental giant cells in the blood spaces of the wall of the uterus would indicate that this form of cellular embolism is in a measure a physiological one. Lubarsch accepts Kassjanow's conclusions, but he himself has not yet been able to find giant cells in non-eclamptic puerperæ.

3. *Ciliated Cell Emboli.* P. Foa found ciliated cells from the bronchial lining in a thrombus in the pulmonary artery, but it is difficult to understand how such cells could enter the circulation during life. Possibly the appearances may have been the result of artefacts.

4. *Embolism of Giant Cells of Bone-marrow.* Every form of experi-

¹ Journal of Experimental Medicine, 1898, iii., 549-572.

² Zur Lehre von der Geschwülsten u. Infektionskrankheiten, 1899.

mental cellular embolism gives rise to a secondary embolism of bone-marrow giant cells. This observation renders the diagnosis of cellular emboli in general exceedingly difficult, because it is likely that here also cells may be dislodged from the bone-marrow. Aschoff pointed this out in connection with embolism in eclampsia. Pils-Leusden and Lindfors and Sundberg also found medullary giant cells in the vessels in their cases of eclampsia; and Lubarsch in twenty-two cases of eclampsia found narrow cells in the pulmonary capillaries in every case, although in varying numbers. In fact, Aschoff and Lubarsch find these cells so often in the capillaries of the lungs of both man and rabbit that they think they may be of normal occurrence; and both agree that the cells are of common occurrence in various infectious and other diseases, also in fat embolism, even when the fat does not come from the bone-marrow. Direct concussion of the bone-marrow may liberate giant cells and fat particles, and other substances in the circulation may liberate them probably by virtue of chemotactic influences. Pratt found marrow giant cells in the pulmonary capillaries in lobar pneumonia.

How are these different cells to be distinguished from each other? The marrow cells with giant nuclei often have no protoplasm; the nucleus is often separated into clumps united by narrow bands; the placental cells have separate nuclei, and, being apparently less compressible, they are oftener found in the larger vessels, retaining well their normal form. They have a definite protoplasmic body. The marrow cells also show degenerative changes in the protoplasm, the nuclei showing the chromatin arranged in balls and threads, whereas the chromatin of the placental cells is more regularly arranged (Lubarsch). Liver cells are recognizable only so long as they are not changed or when characterized by fat or pigment in the protoplasm.

A. S. Warthin¹ describes multiple pulmonary emboli of liver cells and giant cells, resembling those of marrow, in a case of traumatic hemorrhage of the liver. He also emphasizes the uncertainty of the diagnosis of placental cell emboli, and claims that it is not possible to differentiate between single giant cells arising from syncytium, placental tissue, bone-marrow, spleen, and lymph-glands.

5. *Osteoclasts as Emboli.* These cells also form emboli, according to Lubarsch. The nuclei are less rich in chromatin than the placental cells.

6. *Fat Cell Embolism.* When bits of bone-marrow are swept into the circulation such breaking up may occur that single fat cells may be found in the capillaries.

I would add to Lubarsch's list of cell emboli:

¹ Medical News, September 15, 1900, lxxvii., 405-413.

7. *Splenic Cells and Endothelial Cells.* Welch¹ has seen large splenic cells containing pigment, blood-corpuscles, and parasites blocking the capillaries of the liver in cases of malaria and typhoid fever. He also states that the crescentic endothelial cells of the spleen may enter the circulation. Indeed, it seems to me, emboli of endothelial cells from various parts may be quite frequent when we consider the enlargement and the movement of these cells incident to their phagocytic activity.

8. *Myocardial Cells.* In sections of the organs of a pregnant woman who had died from typhoid fever Charrin and Levadite² observed emboli of heart-muscle cells within the vessels of the myocardium and in the pulmonary veins in the lung. The authors insist that the appearances described are not the result of an artefact, and the figures illustrating the report show distinct heart-muscle segments within the vessels mentioned. If confirmed, this observation may add another proof in favor of the vital nature of myocardial segmentation. I have looked over many sections of segmented myocardium and of the corresponding organs; myocardial cells and fragments occur occasionally in the myocardial vessels, but I have not yet found an example in which I could exclude the possibility of accidental disturbances. Myocardial cells were not found in other organs.

Lengemann³ concludes his experimental study of the fate of dislocated and embolized parts of tissue as follows: Experimental cellular embolism leads to thrombosis and leucocytosis. Every embolism of parenchymatous cells leads to embolism of giant cells of the bone-marrow. In eclampsia emboli of placental cells may be confounded with medullary giant cells. Even bits of marrow tissue may be dislodged and carried to the lungs in parenchymatous embolism. The cellular emboli rapidly undergo coagulation necrosis, karyorrhexis, and chromatolysis. Occasionally mitoses are seen in renal, hepatic, and placental cells, but new tissue is never found. The embolus is substituted by connective tissue. Hence it would seem that in tumor metastasis there is an increased proliferative power on the part of the cells.

Fat Embolism. Fibiger⁴ reports a well authenticated case of fatal oil embolism following Leube's method of subcutaneous nourishment with daily injections of olive oil, the point of the needle evidently puncturing a small vein. Emboli of oil were found in almost all organs, most numerous in the lungs and the brain.

In fat embolism following fractures and injuries Ribbert⁵ believes

¹ Allbutt's System.

² Journal de Physiologie et de Pathologie Generale, 1899, i., 1140-43.

³ Lubarsch, Zur Lehre von der Geschw. u. Infektionskrankheiten, 1899.

⁴ Nordiskt Medicinskt Arkiv, 1900, xi., Häft 1.

⁵ Deutsche med. Wochenschrift, June 28, 1900, 419-421.

that concussion of the skeleton is the cause of embolism. It is rather difficult to explain the entrance of fat into torn vessels, as the blood current from the tear in the vessels would appear to prevent the entrance of fat. Ribbert also finds the quantity of fat entering the circulation is too great to be accounted for by the old explanation. In rabbits careful fracturing of bones did not cause embolism, but concussion of the body did. The fat probably comes from the bone-marrow, the blood spaces of which readily permit its entrance.

Fragmentation of Elastic Fibres. The pathological changes in the elastic fibres have been but little studied except as regards the skin and the bloodvessels. M. B. Schmidt described granular disintegration of the elastic fibres of the lungs, and v. Recklinghausen a beaded appearance of the fibres in a laryngeal ulcer. Davidsohn,¹ in an instance of sarcoma of the spine with metastatic deposits of lime in the lungs, the heart, and the kidneys, found that in the lungs the deposition of calcareous particles had taken place, especially in and about the elastic fibres, which were thickened and broken up into fragments not unlike chains of anthrax bacilli. Similar changes were found in the lungs in a case of carcinoma of the stomach with osseous metastases, and in two other examples. Davidsohn holds that fragmentation occurs in organs in motion, the composition of the blood being altered (lime metastases in tumors of bones), and that the deposition occurs immediately about the fibres and with a suddenness like that of embolism.

Ferriferous Elastic Fragments in Giant Cells. Elastic fibres persist long in giant cells in tuberculous tissue, especially in the skin. In sections from a growth in the skin of the nose, diagnosed clinically as rhinophyma, I found innumerable elastic fragments, partly free, partly within giant cells, and surrounded by vacuoles. Apparently the giant cells slowly absorb the elastic fibres which otherwise rapidly disappear under the influence of inflammatory processes. This might be construed, as suggested by Rona,² as an indication that the metabolic processes in giant cells are delayed. Pieces of elastic fibres enclosed within giant cells have been shown by Rona and others occasionally to become impregnated and encrusted with calcareous and ferruginous substances. Recently I have had occasion to study peculiar formations composed of fragments of elastic fibres encrusted with iron within giant cells in an old fibrous and cellular hemorrhoidal nodule. Doubly contoured, rounded, and apparently budding bodies, as well as oblong and more oddly shaped ones, are present within giant cells. The resemblance to so-called parasites in malignant tumors, as figured by various observers

¹ Virchow's Archiv, 1900, clx., 538-551.

² Ziegler's Beiträge, 1900, xxvii., 349-358.

—*i. g.*, Roncali¹—is striking and suggests the possibility that some of the calcified blastomycetes described by him and others may have been of this nature. Treatment with ferrocyanide of potassium and hydrochloric acid and acid orcein or Weigert's elastic fibre stain show a short, central thread, staining as elastic fibres, straight, curved, or curled, surrounded by a mantle giving the iron reaction.

Local Amyloid Growths. Manasse² and Glockner³ record interesting cases of these peculiar pathological productions. Manasse's first case was in a man, aged sixty-three years; the amyloid tumors were situated upon the posterior wall of the trachea, under the mucous membrane; the masses were nodular and transparent and developed in pre-formed normal tissue; islands of bone and cartilage were present in some of the nodules. Manasse's second case occurred in a man, aged fifty years, who complained of dyspnoea and dysphagia; amyloid nodules were found in the soft palate, both tonsils, and the left aryepiglottic fold; the last was pedunculated and 2.5 cm. long.; here the amyloid substance had developed in a decidedly sarcomatous tissue. In Glockner's case—a man, aged seventy-three years—there were amyloid deposits in the larynx, trachea, and large bronchi, and consecutive laryngo-tracheal stenosis. Multiple exostoses were present, and large clumps of amyloid material filled the lymph spaces. Multinuclear giant cells, apparently derived from the endothelium and concerned in absorption of amyloid substance, were present in all these cases. The cases illustrate the deposition of amyloid in the spaces of tissues rich in elastic fibres and cartilage, in both of which sulpho-chondritic acid is present, and, according to Krakow, amyloid material is a compound of sulpho-chondritic acid and albumin. This phase of the subject is discussed well by Glockner.

Davidsohn⁴ and Schepilewsky⁵ discuss experimental amyloid degeneration, the results being largely confirmatory of the work of Krakow and others. Obrzut⁶ would derive amyloid material from red blood-corpuscles, hyaline substances produced by corpuscular disintegration being deposited in the walls of the vessels as amyloid. He gives illustrations of morphological appearances pointing to this mode of origin in the liver and spleen.

Fat Necrosis. Some of the problems in connection with disseminated fat necrosis have not yet been solved. Thus experimental fat necrosis has usually been limited to the fat immediately around the pancreas; the wide distribution observed in some spontaneous cases has

¹ Journal of Pathology and Bacteriology, 1898, v., 1-12.

² Virchow's Archiv, 1900, clix., 117-136.

³ Ibid., clix., 583-602.

⁴ Ibid., 1899, clv., 382-387.

⁵ Centralbl. f. Bakt., Abth. I., 1899, xxv., 849-862.

⁶ Archiv de Méd. Exp. et d'Anat. Path., 1900, xii., 203-219.

not been fully reproduced. Opie,¹ however, shows that by ligating the pancreatic ducts in cats, which may live for twenty to thirty days after the operation, and thus allowing the entire secretion of the pancreas to penetrate into the tissues of the surrounding organs, wide diffusion may take place, and necrosis results not only in the abdominal fat, but in the pericardial and subcutaneous as well. Stimulation of the pancreas by pilocarpine after ligation of the ducts materially hastens the dissemination of the necrosis. It will be recalled that the experiments of Flexner and others have shown definitely that the essential condition for fat necrosis is the penetration of the fat-splitting ferment of the pancreas into fat tissue. Altogether one may say that we are now able to reproduce experimentally all the features of fat necrosis observed in man and animals; and Flexner's² recent work on experimental pancreatitis has thrown considerable light on two forms of pancreatitis observed in man and generally associated with disseminated necrosis, because the lesions permit the diffusion of the ferment, namely, the suppurative and the gangrenous. The causation of the hemorrhage, often associated with pancreatitis and often the most prominent feature of the process, is still rather obscure. But this phase of pancreatitis properly belongs in another section.

Ochronosis and Pigmentation of Cartilage (Pseudo-ochronosis) Produced by Formalin. Heile³ adds two new cases of ochronosis to the four previously described by Virchow, Bostrom, Hansemann, and Hecker and Wolff. One case is examined thoroughly. Here there was an old clot in the pelvis. Macroscopically there was observed a grayish-black discoloration of the costal cartilages, the intervertebral disks, the laryngeal, tracheal, and various articular cartilages. The costal cartilages were most intensely and most uniformly stained; in the interior occasional yellowish-brown areas occurred. The intima of the aorta was also more or less pigmented. Microscopically the cartilaginous matrix was fibrillated, the cartilage cells destroyed, and a brown granular pigment present as well as a diffuse pigmentation; but pigmentation also occurred in otherwise normal cartilages. Similar granular pigment was found in the cells of many normal organs and tissues not visibly pigmented. The retrosternal glands were pigmented and also infiltrated with a colorless iron compound that became blue on treatment with ferrocyanide and hydrochloric acid. Elsewhere the granular and diffuse pigment gave no iron reaction under any circumstances. The granular pigment stained green with methylene-blue—a characteristic of iron-free pigments (Buss). The pigment was dissolved in boil-

¹ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 859-876.

² Ibid., 743-771.

³ Virchow's Archiv, 1900, clx., 148-173.

ing caustic potash (10 per cent.) and also in other substances. The solutions gave a slight iron reaction. Spectroscopically and microspectroscopically the pigment is indifferent, and seems to belong to the melanin group of pigments. The chemistry of this production is unknown.

It is evident that ochronosis is not merely an increased senile pigmentation, as first thought by Virchow, because of the early age at which the process may occur—at thirty-six in one of Heile's cases. Boström regarded ochronosis as the result of retention of blood-pigment, but there is hardly enough evidence to show that ochronosis depends on the extravasation of blood. Heile regarded it as a special form of hæmachromatosis of cartilage, connective tissue, tendons, periosteum, periportal connective tissue, aortic intima, etc.—*i. e.*, a hæmachromatosis of the collagenous tissues. In order to explain the rarity of the process some special predisposition may be assumed, as, for instance, such as might result from more or less extensive circulatory disturbances (which was the case in all the six instances recorded). In three there was also chronic rheumatic arthritis. In two there was melanuria (Hansemann, Hecker and Wolff).

Heile then considers the pigmentation produced in cartilage by the prolonged action of formalin. This is most marked externally. Experiments showed that strong solutions almost immediately produce finely granular black or yellowish-brown intercellular pigment in cartilage, striped muscle, liver, lung, spleen, etc.; weak solutions act slowly, requiring at least forty-eight hours. Organs containing much blood become blackish almost at once. The discoloration of cartilage seems to proceed from the perichondrium, and Heile shows conclusively that this "pseudo-ochronosis" depends on the presence of blood in the tissue. In cartilage the pigment is deposited also in the cells and their nuclei. Fat crystals are stained nicely. The pigments are chemically indifferent. At first dissolved, they are subsequently deposited in granular form about the nuclei and the protoplasmic granules. This demonstration emphasizes the necessity of great care in the interpretation of pigments found in tissues, such as liver, fat tissue, etc., hardened in formalin. I have repeatedly seen peculiar pigmentation of the liver in formalin specimens.

TUMORS.

Frequency of Tumors. Roswell Park¹ upholds his belief in the increasing frequency of cancer. He lays stress on the fact that the figures on which his conclusions are based being official the results

¹ Medical News, March 3, 1900.

must stand; but figures are not reliable because official. Much good would be accomplished in various ways if this aspect of the cancer question could be studied by the collective method, which, once inaugurated, should be continued for many years. The necessity for collective investigation is emphasized by Katz¹ and others.

The national statistics of England and Germany also point to increase in cancer. Reiche,² stimulated by the work of Roger Williams, who found such great increase in cancer in England, studied the death register of Hamburg. He finds that in that city there is a slow and gradual increase in the mortality from carcinoma, especially among men—in 1872, 71.63 deaths from cancer in 100,000; in 1898, 97.82.

Maeder's³ careful study of the statistics of cancer in Prussia, Saxony, and Baden for the years 1891–96 shows that the number of deaths from cancer has steadily increased, the increase in Prussia equalling 0.115 per cent. of the total deaths per year. Maeder finds that certain regions shown in Finkelnburg's statistics for 1881–90 as especially prone to cancer still maintain this distinction. Maeder holds justly that diagnosis is not likely to so grow in refinement from year to year, in city and country, as to explain the increase shown by the figures. At the same time as the death-rate from cancer has increased that from tuberculosis has fallen off.

Instances of carcinoma in young persons are reported by Park,⁴ Behring,⁵ and others, and the belief is gaining ground that the age of liability is falling.

From the figures presented by Loeb and Jopson⁶ it is seen that carcinoma in cattle is probably comparatively rare. The vulva and the inner canthus of the eye are the two principal starting-points, the variety being the squamous.

Much has been written of late concerning small endemic cancer foci. Park cites an instance furnished by Dr. Sutton, of Albany, N. Y. Of sixteen deaths occurring within a radius of one and one-half miles nine are regarded as due to cancer. Such occurrences merit careful scientific study; post-mortems should be made and the diagnosis should be placed beyond doubt. The question of accidental coincidence is a troublesome one in arriving at a correct interpretation of the real significance of "cancer endemics."

Etiology of Tumors. Roswell Park,⁷ Czerny,⁸ Arthur Jackson,⁹

¹ Centralbl. f. Bakt., Abth. 1, 1900, xxvi., 655.

² Deutsche med. Wochenschrift, 1900.

³ Zeitschrift f. Hyg. u. Infektionskr., 1900, xxxiii., 235–260.

⁴ Loc. cit.

⁵ Jour. of American Medical Assoc., 1900.

⁶ Medicine, 1900, vi., 286–294.

⁷ Loc. cit.

⁸ Beitr. z. kl. Chir., 1899, xxv., 243–266.

⁹ British Medical Journal, November 25, 1899, ii.

Baring,¹ Smith and Washburne,² and others review in a more or less general way the clinical and other characteristics of malignant tumors, especially carcinoma, and all find much to support the theory of a parasitic etiology. Park and Czerny point to the evident influence of irritation, chronic tissue changes, scars, trauma, mechanical lesions, and other factors which may be regarded as inducing a local predisposition. Conveyance of cells from one part to contiguous, adjacent, and distant parts—that is, autotransplantation—points to such degree of vitality in tumor cells that the failure of inoculation experiments probably depends on faulty methods. The cachexia of cancer and the toxicity of cancer juice are as easily, if not more easily, explainable by the parasitic theory as by any other. The fact that undoubted cancerous diseases may undergo spontaneous retrogression leads Czerny to plead for the search for a specific treatment. The consensus of many recent writers is that the parasitic theory, though resting on a slender basis, has as much in its favor as the other hypotheses, and carries with it greater hope for therapeutic and prophylactic measures.

The influence of trauma has been studied especially by Würtz,³ who found that of 129 benign tumors treated in v. Brun's clinic five showed the influence of trauma in their development. Several instances of carcinoma are mentioned that originated in small injuries and wounds which did not heal; six sarcomas developed very soon after injury to the tissues at the site of the growth. By trauma is meant cutaneous and wounds of various kinds, and not chronic irritations, etc.

In his statistical study of carcinoma of the lip, Loos⁴ found a history of an insignificant trauma very commonly.

Otto Hahn⁵ describes the development of carcinoma in an ulcerating, infected scalp wound seven weeks after a fall from a wagon; and Carola Maier⁶ details a squamous carcinoma in the interior of the radius, developing in direct sequence of a definite trauma without fracture or wound in the skin, thus bringing forward the question whether the matrix of the tumor was of embryonal origin or perchance composed of cells carried into the marrow spaces through a fissure at the time of the injury. The possible metastatic nature of the tumor is excluded by the circumstance that the patient remained in perfect health after the operation, three years previously. These cases are of interest also because of the practical questions involved, as, for instance, that of accident insurance.

Sailer,⁷ in a valuable summary of the literature on the inoculability

¹ British Medical Journal, November 25, 1899, ii.

² Wien. med. Blätter, January 18 and 25, 1900.

³ Beitr. z. kl. Chirurgie, 1900, cxxvi., 567-590.

⁴ Ibid., 1900, cxxvii., 57-126.

⁵ Ibid., 1900, cxxvi., 591-594.

⁶ Ibid., 553-566.

⁷ American Journal of the Medical Sciences, 1900, cxx., 190-202.

of carcinoma, finds that it is probably useless to persist in inoculating lower animals with human carcinoma. Accurate studies on the transmission of spontaneous tumors in lower animals to other animals of the same or of different species are desirable.

The alleged production of peritoneal carcinoma in rabbits, claimed by Lack¹ to have been accomplished by dissemination of ovarian cells by scraping, is of doubtful value because of certain nodules in the endometrium of the rabbit experimented with. These nodules may have been the primary tumor. Shattock² describes spontaneous uterine carcinoma in the rabbit.

In the discussion of the histogenesis of carcinoma at the Eighth International Medical Congress in Paris, August 2-9, 1900,³ the idea that carcinoma is a disease of unknown origin of normally located or aberrant epithelial cells seemed most favored by the participants (Hlava, Babes, Ziegler, and others). Podwyssotski alone insisted on the parasitic nature of some of the inclusions. The inconsistency of the biological character of carcinoma with the parasitic theory was urged by Ziegler; and Petersen looks on the simultaneous origin of many carcinomata from several centres (multicentral carcinoma) as favoring the view that it begins in the epithelium. Cullen, in his classical book on *Cancer of the Uterus*, reaches the same conclusions from the histological appearances in early carcinomata of the uterus.

What has been Done Toward the Actual Establishment of a Parasitic Etiology of Malignant Tumors during the Past Year? Several investigators have described different organisms which they have secured in cultures from tumors and which they are disposed to regard as playing the part of causative agents. In no case, however, does it seem to me that incontestable evidence has been brought forward in proof of this claim. The work of such men as Leopold is certainly entitled to respectful consideration, but in several other instances it would seem that the publications are remarkable chiefly on account of prematurity, which should be especially shunned at this stage of events in this much vexed question.

BLASTOMYCETES IN CARCINOMA. Leopold,⁴ in Dresden, describes in detail his methods by means of which he isolated blastomycetes from four carcinomata (ovary, two; mamma, and cervix uteri) under conditions that must be regarded highly favorable for accurate results. An interesting feature of Leopold's work is the prolonged study (for two hundred days or more) of carcinoma tissue in hanging-drops of sterile

¹ Journal of Pathology and Bacteriology, 1899, vi., 154-157.

² British Medical Journal, January 20, 1900, i.

³ Centralbl. f. Path., 1900, xi., 615-618.

⁴ Arch. f. Gyn., 1900, lxi., 77-120.

bouillon in a specially constructed thermostatic microscope.¹ The tissue selected for investigation was removed from the advancing margin of non-ulcerous carcinomata. In the hanging-drop preparations a host of interesting appearances were seen; among these were forms that correspond accurately to blastomycetes in various stages of development—glistening, double-contoured budding, globular bodies that were not affected by caustic soda. The organism isolated from the four tumors mentioned produced fermentation of glucose into carbonic acid and alcohol. In one case fresh sterile fragments of tumor tissue produced fermentation. In fixed preparations of the tumors the blastomycetes vary greatly in form after the application of various staining methods, but double-contoured, budding forms as well as round bodies were found, concerning the blastomycetic nature of which Leopold thinks there is no question. Leopold's animal experiments have given the following results: 1. Fresh implantation of carcinoma tissue in the abdominal cavity of a rabbit was followed four years and five months later by death from atypical epithelial proliferation in the lungs. 2. Implantation of fresh carcinoma tissue in the abdomen of a rat was followed by death, caused by an "adenosarcoma" in the right groin. 3. Multiple round-cell and giant-cell sarcoma in the abdomen of a rat produced by the injection into the testicle of a pure culture from carcinoma of ovary. Blastomycetes were present in the fresh and in the fixed tissues of all the three human tumors, and were found again in the tumors in the animals experimented upon; and in the experiments three pure cultures were secured. At present Leopold's work may be said to show: Blastomycetes in the fresh tissue of a carcinoma of the ovary; isolation in pure culture; injection of pure culture into the testicle of a rat producing peritoneal nodules of the structure of round-cell and giant-cell sarcoma containing blastomycetes in large numbers and easily isolated.

The somewhat paradoxical action of the organisms in sometimes producing sarcomatous growths in animals is, of course, calculated to disturb our faith in their being the cause of human carcinomata. Future work may remove this stumbling-block. Leopold's own views seem to be quite unprejudiced, and further reports will be awaited with interest.

Sanfelice explained the varying effect of blastomycetes in inducing new connective tissue growths and new epithelial proliferations in animals as dependent upon the kind of tissue with which the organisms come in contact. If this was the case we should expect to find carcinosarcomata much oftener than we do now, which is extremely infrequently indeed.

¹ An early report of some results with this method was made by Rosenthal, Arch. f. Gyn., 1896, li.

Keith Monsarrat¹ also reports finding organisms in carcinoma which on intraperitoneal inoculation produced new growths of endothelial cells in the peritoneum, the liver, and elsewhere, which contained the organisms injected in large numbers. He regards the parasitic theory as the best working hypothesis.

Vedeler² studied the cellular inclusions in the epithelium of a cysto-adeno-carcinoma of the ovary. From the presence of blastomycetoid bodies in the epithelial cells of the lining he thinks tumors of this class would be a favorable place for further search by cultural methods.

Wlaeff³ briefly mentions that he has found yeasts in pure culture in the juice of a sarcoma of the uterus, and in the sections they were demonstrated by Gram's method. These organisms grow only on acid glucose-agar made with the tumor juice. In his extensive study of the experimental lesions of blastomycetes (see page 334), Wlaeff obtained nodules of granulomatous or adenomatous, sometimes papilliform, structure. Whether formations of the latter type are to be regarded as true experimental tumors is an open question. Competent observers have found Wlaeff's⁴ preparations of experimental tumors quite striking. Wlaeff speaks of an immune serum from birds that may be used in human carcinoma.

From the remarks of Roswell Park⁵ and his associate, Gaylord, before the Academy of Medicine in New York it is evident that the work so far done in the State Pathological Laboratory at Buffalo leads them to look forward with some hope of obtaining evidence of the etiological action in some tumors of blastomycetes.

Carini⁶ failed to obtain blastomycetes in cultures from a large number of tumors. Carini found the bodies regarded by Sanfelice as blastomycetes in sections of eighteen out of forty-one tumors, but also in other tissues.

Petersen and Exner,⁷ from an experimental study of the lesions produced by Sanfelice's *saccharomyces neoformans* and other organisms, did not secure any evidence pointing to relation between blastomycetes and genuine tumors.

Podwyssotski⁸ made experimental inoculations with parasitic growths on cabbage and other plants caused by myxomyces. Connective tissue proliferations with abundant evidence of phagocytosis resulted, but the growths were evanescent, and it certainly is far-fetched, if not useless,

¹ British Medical Journal, February 24, 1900, 446.

² Norsk Mag. f. Lægevidenskaben, 1900, lxi., 160-175.

³ C. R. d. l. Soc. Biol., 1900, lii., 759-760.

⁴ Centralbl. f. Path., 1900, xi., 631-632.

⁵ Loc. cit.

⁶ Centralbl. f. Path., 1900, xi., 438 (Abstract).

⁷ Beitr. z. kl. Chir., 1899, xxv., 769-780.

⁸ Centralbl. f. Bakt. Abth. I., 1900, xxvii., 98-101.

to apply results of this kind to the explanation of malignant tumors. Experiments of this sort merely have direct bearing on the actions of the organism used.

ANIMAL ORGANISMS IN TUMORS. Nils Sjöbring,¹ one of the first advocates of the coccidian nature of cell inclusions in tumors, reports the results of his culture experiments. The medium was peptone-gelatin and ascitic fluid, with a 1.5 per cent. of concentrated aqueous solution of potassium soap of human fat. Cultures from various tumors were obtained, the organisms being exceedingly delicate, and they are assigned to the rhizopoda. The principal forms seen in the cultures were amœboid, rhizopodal, and forms resembling the fuchsin bodies of Russell. Genuine tumors are said to have been produced in white mice by means of cultures. These growths consisted of epithelial proliferations starting at the point of inoculation, described in one case as cylindrical-celled carcinoma, but without metastasis, in one as a sebaceous adenoma, and in the third and fourth as cysts with epithelial lining. I may recall the fact that in coccidiosis the lesions are characterized by proliferation of epithelium as well as of connective tissue. An organism, whether animal or vegetable, which is claimed to produce tumors, would receive much attention if shown that it causes genuine tumors in animals. Sjöbring's organisms meet this requirement in a measure; his work needs confirmation and elaboration.

Max Schüller² claims to have cultivated organisms, probably of animal nature, from sarcoma and carcinoma, and to have elaborated a method whereby the organisms are rendered plainly visible in tumor tissue. In the cultures roundish or oval, rarely irregular, pale bodies develop of golden-yellow or brownish color, three times and more the size of red globules. The bodies consist of a clear capsule with a more opaque interior. The capsule seems provided with numerous pores. Sometimes three to four and more globular, deep or grayish-brown formations are seen within the capsule. In the youngest forms protoplasmic prolongations are seen to pass out through the pores, but when the organism is dead the processes appear to retract. We are told that these bodies are best demonstrable in the tissues by teasing pieces preserved in alcohol and clearing with oil of lavender. The bodies often occur in clumps, the smaller, younger forms occurring within and between the cells. So far sections are best studied when stained lightly with alum hæmatoxylin.

The cultures appear to have been made with sterile pieces of the tumors kept in small glass vessels, protected from the light and at the

¹ Centralbl. f. Bakt., Abth. I., 1900, xxvii., 129-140.

² Ibid., 1900, xxvii., 511-516.

body temperature, the tissue itself being the nutrient substratum. Pearly gray or yellow transparent drops form on the sides of the glass, composed of minute individuals.

Animal inoculations are not as yet far enough progressed to be reported.¹

Gustav Eisen² makes a preliminary report on the presence and nature of parasitic amœbæ (*cancrhamœba macroglossa*) in carcinoma. Minute pieces of carcinoma are fixed while absolutely fresh in a solution of bichromate of potassium, 3 parts; glacial acetic acid, 5 parts; water, 100 parts. This fixative is kept as near blood temperature as possible when the pieces are dropped in. After twelve hours the pieces are washed well in water, hardened in alcohols of increasing strength, and embedded in paraffin. The sections, not over 4 microns thick, fixed on the slide, are stained overnight in a 1 per cent. alcoholic solution of eosin, washed in water and stained for five minutes in a 1 per cent. solution of methylene-blue "o," rapidly dehydrated, cleared in oil of bergamot, and mounted. The structures, interpreted as amœbæ, are now stained intensely red with deep blue nuclei, the tissue cells proper being pale red with bluish nuclei.

In pieces of carcinoma not entirely fresh the amœbæ contract and cannot be readily recognized. The *cancrhamœbæ* are found in all epithelial carcinomata, including those without distinct cell nests. In carcinomatous cell nests there is an inner core of amœbæ and loose cells and an outer zone of epithelial cells, the inner cells of which are flattened. The formation of cell nests is attributed to an effort of the epithelial cells to fence in the amœbæ; central hornification contributes to this end. The amœbæ feed on the epithelial cells by sending pseudopods into the cells and sucking out their cytoplasm. The vacuoles often found around amœbæ are the result of destruction of epithelial cells; larger cavities with amœbæ and cellular fragments also form. The *cancrhamœbæ* often reach a size of 25 to 30 microns in length, and the qualification *macroglossa* is added to describe the peculiar "projectile snouts" observed passing to adjacent cells. The amœbæ multiply by spores and by amitotic division.

Beyond expressing the suggestion that the amœbæ may be forms of tumor and other cells, further criticism is withheld until the complete report appears, which Eisen hints will contain accounts of the repro-

¹ The same author (*Centralbl. f. Bakt., Abth. I.*, 1900, xxvii., 516) claims to have found organisms similar to those described by him in tumors in all the various lesions of acquired and congenital syphilis. Oval bodies with double contoured, glistening capsules, brownish-yellow contents, are described in teased preparations and sections treated with solution of iodine and iodide of potassium. Cultures have been obtained, but are not now described.

² *Medical Record*, July 8, 1900, lviii., 6.

duction of the parasites and of the effects of injections of their cultures into animal tissues.

General Histology of Tumors. AMITOTIC CELL DIVISION IN PATHOLOGICAL FORMATIONS, ESPECIALLY SARCOMA AND CARCINOMA. This question has been studied extensively by Nedjelsky¹ in Marchand's laboratory. I shall not repeat the descriptive details. Suffice it to say that amitotic division must be regarded as a progressive process and as playing an important part in cell proliferation in regeneration, neoplasms, and other pathological processes. It begins with enlargement of the nucleus, more pronounced in epithelial tumors than in those of connective tissue origin, and division is accomplished either by a sort of transverse constriction, by stretching, or by both. This mode of division occurs in giant cells in the same manner as in ordinary cells.

EOSINOPHILE LEUCOCYTES IN TUMORS. Feldbausch² describes various tumors in which eosinophile leucocytes were present in large numbers—carcinoma of the mammary gland, of the uterus and female genitalia, and in mediastinal lymphosarcoma, with numerous metastases. In squamous carcinomata there is nearly always increase in the eosinophile cells. They are found in the connective tissue about the tumor, and they are especially numerous in the early stages, having a marked tendency to disappear with time. Apparently the accumulation is the result of immigration. There is no evidence of increased numbers in the blood. I have had occasion to observe quite marked local eosinophilia in a number of instances of carcinoma of the penis. The peculiar forms of attraction that lead to the accumulation of eosinophile cells are not understood.

ELASTIC TISSUE IN TUMORS. Melnikow-Raswedenkow came to the conclusion that little or no elastic tissue forms in tumors; and Jores³ found that connective tissue tumors in general have but slight tendency to the production of elastic tissue. Elastic tissue was found rather plentifully in fibromyomata of the uterus, and this is explained on the score of a matrix rich in elastic elements. Myxomata may also contain much elastic tissue for the same reason, as in Jacobsthal's⁴ myxoma of the heart.

Herbert U. Williams⁵ concludes a study of the new formation of elastic fibres in the stroma of carcinoma as follows: When the stroma is of new formation it is usually free from elastic elements; when present, which is rarely, the fibres are fine and small in number. Newly formed

¹ Ziegler's Beiträge, 1900, xxvii., 431-483.

² Virchow's Archiv, 1900, clxi., 1.

³ Ziegler's Beiträge, 1900, xxvii., 381-406.

⁴ Virchow's Archiv, clix., 351-361.

⁵ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 291-296.

elastic fibres occur in carcinomata with a large amount of connective tissue, being often in connection with the pre-existing elastic elements of the original parts.

W. C. White¹ reaches similar conclusions in regard to elastic elements. New formation of elastic fibres probably occurs, but this can only be determined by a comparison of the new growth with the normal tissue in which it has developed. White found by means of digestion methods that sarcomata possess an exceedingly fine intracellular reticulum; in carcinoma there is no intracellular network, the spaces being formed by white fibrous tissue. Uterine myomas have a large amount of white fibrous tissue and of reticulum.

Alice Hamilton² describes a tumor of the cerebrum which, after some hesitation, she concludes to be a fibrosarcoma originating in the outer walls of the bloodvessels. The majority of fibrosarcomata of the brain described in the literature have of late been regarded as gliomata. The cells in Dr. Hamilton's tumor were mostly round, irregularly oval, or angular. Spindle-shaped cells resembling the so-called brush cells were also present, especially around the bloodvessels, where they presented a parallel arrangement, the processes forming a fibrillar matrix; giant cells also occurred. Perhaps the most interesting feature of this tumor is the presence of elastic elements that passed outward into the tissue from the adventitia of the vessels. By Weigert's elastic fibre stain the relation of the fibres was made out well. Symmetrical rosettes and long, irregularly branching masses of elastic fibres occurred. Close study always showed that the fibres were not cellular prolongations. The presence of such collections of elastic fibres in tumors appears to be quite unique. The chemical nature of the fibres shows conclusively, it would seem, that the growth is of connective tissue and not glial origin.

Hansemann³ mentions a sarcoma of the lung with considerable new production of elastic fibres—the only tumor of one hundred and fifty in which this was the case.

Interesting Forms of Carcinoma. ADENOID SURFACE CARCINOMA (CARCINOMA EPITHELIALE ADENOIDES). Krompecher⁴ publishes a lengthy article upon a peculiar form of glandular carcinoma of surface epithelium, occupying a position midway between squamous carcinoma and adenocarcinoma. It originates from the surface epithelium of the skin and of mucous membranes covered with flat cells, but develops according to the type of glands. Clinically it forms fungoid outgrowths

¹ Bulletin of Johns Hopkins Hospital, 1900, xi., 209–220.

² Journal of Experimental Medicine, 1899, iv., 598–608.

³ Verh. d. path. Gessellsch., 1900, ii., 237.

⁴ Ziegler's Beiträge, 1900, xxviii., 1–41.

or ulcers; unlike typical squamous carcinoma, the adenoid carcinoma does not appear at the junction of mucous and cutaneous surfaces, but in various other places, the skin of the face (cheek, forehead, and nose) of old people being the most common seat. The mammary gland of women is a relatively frequent seat. It begins as a small nodule, which soon breaks down and slowly extends. Lymphatic metastases and recidivation are rare, and the prognosis is comparatively favorable. Rodent ulcer appears to belong to this group.

Histogenetically this form of carcinoma is characterized by proliferation of the cylindrical cell layer of stratum Malpighii, the hair follicles, sweat and sebaceous glands. Solid bands and nests may be formed, with numerous branchings, clubbed, and pointed ends; or narrow layers of cells form complicated folds and wreaths. Within the epithelial bands the connective tissue often appears hyaline or myxomatous. The gland-like bands and cylinders may contain also necrotic masses and hornified epithelium from infoldings of the surface. The proliferating cells constantly retain their embryonal character and do not hornify. The tissue may resemble a spindle-celled sarcoma. The endotheliomata of the skin described by Braun¹ seem to be identical with this form of carcinoma, and the endothelioma of the skin described by J. A. Fordyce² in the scar of a lupus vulgaris is also quite similar in structure, but Fordyce specifically states that it in no way was connected with epithelium of the skin or of its appendages. It is not unlikely, however, that in the process of cicatrization the genetic connection of this tumor with the epithelium may have been greatly disturbed.

MALIGNANT ADENOMA. The oncological relations of so-called malignant adenoma are discussed by Selberg³ and Hanseemann.⁴ Malignant adenoma is a subvariety of carcinoma which originates in the glandular epithelium of the uterus, the intestines, etc., the tumor preserving well the purely glandular character. Its cells do not form many layers or solid columns and do not appear polymorphous. Metastases and recidivations of this type also form, but the proliferations may at any time become atypical and resemble cylindrical-celled carcinoma. Adenoma malignum induces with time a cancerous cachexia, and it has a well-marked tendency to unlimited growth. There is, therefore, no good reason for regarding it as a distinct form of tumor, as advocated by Selberg, because it differs from ordinary carcinoma, not in kind, but merely in degree. Indeed, there is little justification for retaining even the present name, because no word expresses better

¹ Archiv f. klin. Chirurgie, 1892, xliii. (cited by Krompecher)

² American Journal of the Medical Sciences, 1900, cxx., 159-165.

³ Virchow's Archiv, 1900, clx., 552-574.

⁴ Ibid., clxi., 453-461.

than carcinoma the present prognostic and therapeutic conceptions of malignant epithelial or glandular tumors.

ADENOCARCINOMA IN TERATOMA. William H. Hudson¹ describes an interesting instance of fatal adenocarcinoma originating in the sub-mucous glands of a trachea-like formation in a sacral teratoma. It does not seem that malignant growths develop any oftener in teratomata than in normal tissues; but several instances of this kind have been observed recently, and the possibility constitutes a weighty reason for removal of all teratomata when it can be done without danger to life.

CALCIFIED CARCINOMA. Linser² describes a calcified, oval carcinoma of the cheek, 4 x 2.5 x 1.5 cm.

INTERESTING FORMS OF SARCOMA. *Multiple Myeloma.* James H. Wright³ describes an instance of multiple myeloma of the sternum, the ribs, the vertebræ, and the skull. In many instances the tumor tissue had broken through the bony covering and invaded the adjacent soft parts. The patient was a man, aged fifty-four years; the disease lasted about eighteen months; as previously noted in similar cases, the urine contained albumose. The histological character of the growths is interesting. The tissue consisted chiefly of small cells closely crowded together, but interspersed by thin-walled vessels and delicate fibrille. The cells correspond closely to the plasma cell; the cytoplasm did not in all cases present such marked affinity for methylene-blue as the typical plasma cell. The tumor nodules and infiltrations appeared to have arisen by the aggregation of tumor cells between the fat cells of the marrow. Wright was able to find similar plasma cells in the red marrow of healthy persons, and it seems reasonable to assume that the tumors sprang from an abnormal proliferation of the plasma cells and did not develop from the red marrow cells collectively.

Since reading Wright's interesting report I have stained anew and examined sections from a case of myeloma, in many details quite similar to Wright's, and described by Herrick and myself in the *Medical News*, September 1, 1894. The structure is somewhat like that described by Wright. The predominating cell is a cell with the excentric nucleus and the arrangement of the nuclear masses of the plasma cell, the finely granular protoplasm not having as great affinity for methylene-blue as the typical plasma cell. In addition are the cells with a deeply stained, dense nucleus, multinuclear cells, and phagocytic cells. The present condition of the material is not wholly satisfactory for careful cytological observations.

¹ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 795-804.

² Beiträge zur klin. Chirur., 1900, xxvi., 595-612.

³ Journal of the Boston Society of Medical Science, 1900, iv., 195-204.

Winkler¹ records a typical instance of myeloma developing shortly after a fall. He gives an extended discussion of the anatomical and clinical relations of myeloma, and makes the point that metastases outside of the bones do not develop in this tumor; but in the case described by Herrick and myself there were double ovarian tumors of the same structure as those in the marrow. Myeloma has the power to infiltrate tissues outside of the bones, and there is no apparent reason why metastases should not develop.

Rhabdomyosarcoma with Hyaline Degeneration in Voluntary Muscle. Fujinami² describes a tumor of this character from the leg muscles of a man, aged fifty years. The location seems to be an unusual one for this kind of tumor. The hyaline substance present, which gave the growth some of the peculiarities of the so-called cylindroma of Billroth, appeared to have developed partly in the walls of the bloodvessels, often to such an extent as to occlude the lumen, and also in other connective tissue elements and in the tumor elements proper, such as sarcoma cells and muscle cells. Yet the material appears to be the same throughout and to be free from mucin and amyloid. The striped muscle fibres present are regarded as part of the tumor growth, because they were present in the interior of the tumor; of different arrangement than the normal fibres; of various developmental stages; the nuclei were large and distinct; and then there were numerous transition forms to spindle cells with transverse and longitudinal striations. The striped fibres and cells are regarded as originating from the spindle-shaped sarcoma cells, and the whole tumor interpreted as developing from a persistent, unused embryonal muscle matrix that later began to proliferate, certain cells undergoing differentiation, becoming striated, and thus manifesting their real nature.

Melanosarcoma of the Skin. Von Recklinghausen first dissented from the general opinion that melanosarcoma was a form of ordinary sarcoma, and he asserted that pigmented nævi and melanosarcomata arising from them originate from the endothelial cells of lymph vessels and clefts. Then Unna, in 1893, claimed that melanosarcomata of the skin develop from epithelial cells that have become entirely surrounded by connective tissue—that is, the tumor is a melanocarcinoma. There is no intercellular substance. The distribution of the pigment may be so extensive that the connective tissue is covered with it. Unna's view is adopted by Kromayer, Delbanco, Gilchrist, and others. Delbanco claims that nævi cells may grow into lymph vessels, and this is given by some as the possible reason for v. Recklinghausen's view.

¹ Virchow's Archiv, 1900, clxi., 252-310 and 508-529.

² Ibid., 1900, 160, 203-226.

Ribbert holds that melanosaarcoma is of undoubted connective tissue origin, coming, however, from a specific cell *à priori* adapted for it, namely, the chromatophore. He regards melanosaarcoma of the eye and of the skin as identical. Pigmented nævi are collections of chromatophores. Schalek¹ describes two pigmented nævi. Pictures were seen suggesting that pigmented epithelial cells of the lowest epidermal layer proliferate between the elastic fibres of the connective tissue, become entirely surrounded by the latter, and assume, after a number of transitional stages, the character of stellate chromatophores. Schalek also examined two melanosaarcomata of the skin. The tumor cells showed a marked tendency to arrange themselves around the lymph spaces and the vessels. Pigmented connective tissue cells of the appearance of chromatophores were present, and polynuclear giant cells. The cells that are held to be tumor cells proper have an oval or polygonal outline, vesicular nuclei, and pigment granules. The same alveolar arrangement of cells was also observed in a melanosaarcoma of the nose; at the same time there are fusiform cells, "connective tissue chromatophores," with an endotheliomatous, perivascular arrangement, which he would bring into harmony with J. Loeb's observations on the tendency of chromatophores in fishes to arrange themselves around vessels.

Whitehead² points out that the nine tumors of this class that he has been able to examine present the structure of alveolar sarcoma. Naturally there is some hesitancy in declaring as carcinoma a tumor that presents so many characteristics of sarcoma. Whitehead describes two tumors springing from congenital moles and representing the same processes as those of melanotic tumors, with the exception that the melanotic pigment was absent.

The origin of the nævous cells of soft moles and the origin of malignant growths from them is discussed also by Whitfield.³

INTRAVASCULAR GROWTH OF ENDOTHELIOMA OF THE TESTICLE. W. G. MacCallum⁴ describes an interesting tumor extending from the testicle into the great abdominal veins by way of the spermatic, and forming metastases in the lungs and elsewhere. The tumor sprang from the endothelium of the lymph spaces, which were dilated, the cellular lining being heaped up into folds and papillary masses. These nodules thus formed invaded the surrounding tissues and made their way into the veins. Here the growth was covered by the venous endothelium, as seen in thrombi; the intravascular growth had ex-

¹ Journal of Cutaneous and Genito-urinary Diseases, 1900, xviii., 145-153.

² Bulletin of Johns Hopkins Hospital, 1900, xi., 221-224.

³ British Journal of Dermatology, 1900, xii., 267-276.

⁴ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 497-510.

tended, papillary masses were hanging in the lumen of the veins, and occasionally organic, secondary attachments to the wall were found. Reaching the lung through the pulmonary arteries, the small arterioles were perforated and secondary foci developed throughout the lungs. From these pulmonary nodules metastases were again produced in the liver, brain, and intestines. MacCallum properly designates the tumor as lymphendothelioma of the testicle, and he points out that Waldeyer, Breus, Kanthack and Pigg, and Silberstein have described similar tumors under different names, some regarding the tumors as carcinomatous, but in this they seem to have been in error.

ENDOTHELIOMA OF THE LEFT SUPERIOR PULMONARY VEIN. Joseph Sailer¹ describes an endothelioma in this unique situation. There was much connective tissue hyperplasia of the vein, with enlargement of the lymph vessels and the vasa vasorum and proliferation of the endothelial cells of these spaces. There were no metastases, but the resulting occlusion of the vein caused collapse of the upper left pulmonary lobe. Sailer discusses the general subject of endothelioma fully.

ENDOTHELIOMA OF THE GASTRO-INTESTINAL TRACT. Ssobolew² describes an endothelioma of the lymphatic spaces of the walls of the stomach, small and large intestine in the form of multiple nodules, probably of simultaneous and independent origin, and varying in size, the largest being as large as hazel-nuts. Many of the cells contained vacuoles, which possibly had been filled with glycogen, and also small fat droplets, reminding one of the fatty changes in the endothelioma of the marrow of the tibia described by Ritter.³

CHOLESTEATOMATOUS ENDOTHELIOMA OF THE CHOROID PLEXUS. George Blumer⁴ describes an example of bilateral cholesteatomatous endothelioma of the choroid plexus, similar to the cholesterin-containing tumors of the choroid plexus in the horse (Gamgee, Kitt, Sailer, and others). These tumors differ from ordinary human basal cholesteatomata in being bilateral, in not having the peculiar mother-of-pearl refractivity, in being highly vascular, and in not having a peripheral zone of epithelial cells. They begin with proliferation of the endothelial cells of the perivascular spaces, followed by hemorrhage and the appearance of cholesterin crystals, probably formed by destruction of the tumor cells. Cholesterin crystals act as foreign bodies and induce the formation of peculiar giant cells and new connective tissue that

¹ Pepper Memorial Volume, 1900, 416-444.

² Virchow's Archiv, 1900, clxi., 56-69; also Vratich, February 5, 1900.

³ Deutsche Zeitschrift f. Chirurgie, 1899, l., 349-372.

⁴ Contributions to the Science of Medicine by the Pupils of William H. Welch, 1900, 279-289.

later changes into mature tissue, when the giant cells may return to single elements.

ENDOTHELIOMA AND OTHER TUMORS OF THE DURA. Virchow¹ points out that the tumor he originally described as psammoma is a true connective tissue tumor and not the calcified endotheliomata and "canceroids" of the dura, which authors generally designate as psammoma. The distinguishing feature is not the sand-like deposit but the nature of the pre-existing growth.

Engert,² after studying twenty-five tumors of the dura, finds that they may be placed in four groups: (1) Fibromata, which when calcified would correspond to psammomata in Virchow's original sense; (2) cellular tumors resembling endotheliomata; (3) pure, actively proliferating sarcomata, and (4) growths of an angiosarcomatous appearance. All these tumors are derived from the superficial layers of the dura.

Spiller³ describes an endothelioma invading the gasserian ganglion, destroying many of its cells and causing extensive degeneration of the medullary sheaths; secondary miliary endotheliomata developed upon the inner surface of the dura—a very rare event.

CALCIFIED ENDOTHELIOMA. Linser⁴ describes complete calcification of an oval endothelioma of the thigh, 16 x 9 x 8 cm. in size. The matrix had undergone a hyaline degeneration.

PERITHELIOMA OF THE PAROTID GLAND. Von Heinleth⁵ describes an interesting tumor of the parotid gland; the tumor, which had existed for a long time, surrounded the bifurcation of the carotid artery and measured 3.5 x 5 x 8 cm., being 21 cm. in circumference. It was composed of a capillary network, the meshes of which were filled with heaps of oval ("perithelial") cells often enclosing empty spaces (lymphatic?). On account of structural similarity it is concluded that the tumor sprang from the carotid gland.

Mixed Tumors. M. Wilms⁶ advances a new theory in regard to the origin of mixed tumors, tracing it to a matrix which possesses the power to give rise to the diverse substances these tumors contain. This matrix is like the fertilized egg from which all the tissues of the body develop—that is to say, Wilms carries the embryonal theory of the origin of these tumors further back in the developmental history than heretofore customary. The tumor matrix does not contain differentiated cartilage, muscle, etc., but merely the *anlage* for their development. The mixed tumors of the kidney, for instance, are traced to mesodermal cells from which myotomes develop:

¹ Virchow's Archiv, 1900, clx., 32-34.

² Ibid., 19-31.

³ Journal of the American Medical Association, April 28, 1900, 1032-1033.

⁴ Beiträge zur klin. Chirurgie, 1900, xxvi., 595-612.

⁵ Centralbl. f. Path., 1900, xi., 599-603.

⁶ Die Mischgeschwülste, Leipzig, 1899.

Herzog,¹ in describing an instance of embryonal adenosarcoma of the kidney in a girl, aged sixteen months, takes occasion to point out that it is not necessary to resort to such an extensive metaplasia as demanded by Wilms' theory of the genesis of these tumors from the inclusion of myotomes, but that inclusion of myotome and nephrotome readily explains the presence of the various heterogeneous elements.

Beneke² describes with much fulness of detail a unique osteoid chondrosarcoma of the urinary bladder in a man, aged seventy-two years. As far as known, the tumor was primary in the bladder; numerous recidivations occurred. The tumor contained islands of cartilage, osteoid tissue, small round cells, and some striped muscle fibres. It is regarded by Wilms as analogous to the mixed genito-urinary tumors studied by him. Beneke discusses at length the question of possible origin by metaplasia in the elements of a vesical papilloma.

Interesting Benign Tumors. CONGENITAL MULTIPLE RHABDOMYOMA OF THE HEART. Seiffert³ describes an instance of congenital multiple rhabdomyoma of the heart occurring in a child, aged one year and eight months. Two large nodules, the largest the size of a walnut, were present in the wall of the left ventricle, and several smaller ones were scattered throughout the walls of the right ventricle and in the interventricular septum. On section the tumors were of a uniform reddish-gray color, not encapsulated, yet well outlined and sharply demarcated from the endocardium and pericardium. Microscopically the structure was peculiar. There were closed small spaces of various shapes, without a definite lining, and separated from one another by thinner and thicker trabeculæ, which were transversely striated. The spaces did not communicate with each other, and contained nothing but large polygonal cells, of irregular outline, with one or more round or oval central nuclei and an indistinctly striated protoplasm. These cells sent out numerous prolongations, which joined the walls of the space. In other instances the cell seemed to form part of the wall, and then it sent prolongations across the cavity. The protoplasm and the prolongations of these cells stained red with eosin, yellow with picric acid, and brownish-yellow with von Gieson's method; the fibres of the network stained in the same manner. Some of the smaller nodules consisted of delicately striated bundles, one-fifth to one-third as broad as the normal fibres.

The peculiar appearance I have referred to was observed also in the rhabdomyomata of the heart described by v. Recklinghausen, Virchow, Hlava, Kolisko, and Cesaris-Demel. The spaces have received different

¹ American Journal of the Medical Sciences, 1900, cxix., 693-702.

² Virchow's Archiv, 1900, clxi., 70-115.

³ Ziegler's Beiträge, 1900, xxvii., 145-172.

interpretations. Ilava regarded them as intracellular, Kolisko as intercellular. Seiffert makes it quite clear that each space with its wall and contents represents a greatly enlarged embryonal heart-muscle cell, and he refers the rhabdomyomata to abnormal embryonal development. This interpretation agrees with the observations of Felix upon the presence of cavities in embryonal skeletal muscle cells, and Ribbert has referred certain appearances in the cells of rhabdomyomata to a persistence of this embryonal condition. Seiffert finds that embryonal heart muscle cells contain like spaces in their interior.

MYXOFIBROMA OF THE HEART. Jacobsthal¹ describes an instance of primary myxofibroma of the left auricle in a girl, aged four years. The tumor had caused a marked hypertrophy of the heart, especially the right ventricle, death resulting from cardiac insufficiency. Microscopically the tumor contained numerous newly formed elastic fibres.

ENCHONDROMA. Ernst² describes the penetration of an enchondroma of the spinal column into the veins, filling to distention the entire inferior vena cava and its branches, the tumor mass projecting into the right auricle; beginning again immediately above the pulmonary semilunar valves was a complete cartilaginous cast of the pulmonary arteries and their branches. There were no metastatic nodules or infarcts. Tumor masses or fragments were not found in the heart. Presumably a rather large piece had been broken off from the mass in the vena cava and carried into the pulmonary artery, thus forming the starting-point of the mass in the pulmonary arteries.

MYOMA AND ADENOMYOMA. Friedrich Cohen³ has studied the histology and histogenesis of myoma of the uterus. I abstract his conclusions, which represent the present knowledge on this subject: Two forms must be distinguished—globular myoma, with few and scattered epithelial elements, and the adenoma proper of the uterus. The presence of a few epithelial elements in uterine myoma may depend (1) on the inclusion in the growing tumor of intermuscular uterine glands that originally were connected with the mucous membrane, or (2) deeply misplaced in the muscular wall of the uterus during embryonal development; (3) remnants of the Wolffian body. Adenomyoma proper, in which muscular and glandular proliferation is present, may originate from adenomatous changes in Wolffian remnants or in post-embryonally dislocated uterine glands. These two kinds of adenomyoma may be histologically identical, and it may be difficult to distinguish between the two modes of origin mentioned.

¹ Virchow's Archiv, 1900, clix., 351-361.

² Verh. path. Gessellschaft, 1900, ii., 158-161; Ziegler's Beiträge, 1900, xxvii., 255-295.

³ Virchow's Archiv, 1899, clix., 524.

Cohen further describes an adenomyoma of the stomach, which is traced back to misplaced lobes of an accessory pancreas, so that such tumors may have a congenital origin as well as the uterine. Mast cells were numerous, especially about the bloodvessels, which is the case in the uterine tumors as well. Hyaline balls were found in the myomatous tissue and hyaline cells, and globules were plentiful in the overlying atrophic mucous membrane.

Steiner¹ has published a thorough study of the myomata of the gastrointestinal canal. Interstitial, submucous, and subserous myomata are distinguished; multiple myomata may occur.

Engelhardt² adds another adenomyoma of the round ligament, which he ascribes to Wolffian remnants in accord with v. Recklinghausen's explanation of the adenomyoma of the uterine horns; it is thought the ligament, originating from parovarium, brings the glandular elements with it as it comes over the ovary and the posterior surface of the tube to the vaginal region. J. C. Hirst³ writes on the histology and microscopical diagnosis of uterine adenomyomata. He describes an adenomyoma on the dorsal surface of the uterus, which he traces to epithelial inclusions from the Müllerian duct.

LYMPHOMA. Le Cout⁴ describes an isolated growth from the left groin presenting the clinical features of a benign tumor—gradual growth over a period of fifteen years—and the structure of a lymph gland. None of the histological features of inflammation were present, and the lymphadenoid structure was quite perfect.

ORIGIN OF MULTIPLE LIPOMA. Askanazy⁵ traces the development of multiple lipoma to a replacement by fatty tissue of lymph glands, the physiological paradigm of the process being the fatty transformation of the thymus and the bone-marrow. Thomas Curling, in 1850, suggested some connection between lipomata and thyroidal disease, and in Askanazy's case of multiple lipomata the thyroid was invaded by a sarcoma in the neck, which destroyed the patient's life.

RARE FORMS OF CYSTS. Kühne⁶ describes several interesting and rare cysts. Among them are three instances of cysts in the small intestine, ascribed to Lieberkühn's crypts, the closure of which probably resulted from inflammatory changes. Such cysts are to be distinguished from cystic dilatation of chyle vessels, cystic dilatation of the lymphatic vessels due to accumulation of serous or gaseous contents, and cysts due to closure of Meckel's diverticulum.

¹ Beiträge zur klin. Chirurgie, 1898, xxii.

² Virchow's Archiv, 1899, clviii., 556-567.

³ American Journal of the Medical Sciences, 1900, cxix., 281-292.

⁴ Journal of Experimental Medicine, 1899, iv., 559-567.

⁵ Virchow's Archiv, 1899, clviii., 407-425.

⁶ Ibid., 345-387.

Several cysts in the œsophagus are described ; some are regarded as retention cysts, and occurred only in those parts of the œsophagus where glands normally occur, namely, in the upper and the lower thirds ; in these cysts genuine corpora versicolorata were found. The occurrences of gastric mucous membrane in the œsophagus (Eberth), together with glands like those in the stomach (Schaffer), due, it is thought, to differentiation of the entodermal epithelium, which forms, on the one hand, the lining of the stomach, and, on the other, that of the œsophagus, render the formation of small cysts with cylindrical epithelium quite possible, and one such instance is described.

Three cases of splenic cysts are reported ; two are regarded as lymph cysts, because of the presence of smooth muscle cells in the walls, while the third is held to have resulted from inclusions of the peritoneal epithelium due to perisplenitis.

According to Aschoff cervical cysts are divided as follows : Dermoid or branchiogenic cysts, lymph cysts, blood cysts, traumatic lymph cysts, cysts around foreign bodies, and cysts due to inflammation of the lining of the bursa in the median line of the neck. Kühne describes an ordinary branchial cyst and a second one the interpretation of which seemed more difficult. It was lined with cylindrical cells situated upon a thick layer of smooth muscle tissue containing numerous glandular formations, so that many sections much resembled sections of the uterus. Kühne ascribes the tumor to disturbances in the development of the branchial arches, the mucosa and the glands being referred to the branchial tracts, the muscle as coming from the pharynx, and the name branchiogenic adenomyoma is suggested. He further suggests the following classification of the abnormal branchiogenic formations :

1. Tumors with a single epithelial lining. The epithelium may be entodermal (cylindrical, eventually ciliated), ectodermal, or entodermal and ectodermal.

2. Branchial remnants with pathologically modified walls and contents : (a) Abscesses ; (b) blood cysts lined with epithelium ; (c) adenoma and carcinoma from proliferation of the epithelium ; (d) compound tumors of epithelial and connective tissue origin.

3. Teratoma.

Cystic lymphangioma (?) in the abdomen. Henke¹ observed innumerable oval or globular cysts, varying in size from pinhead to walnut, and situated upon the peritoneal serosa. The contents were serogelatinous, the fibromuscular wall being lined with cuboidal and cylindrical cells ; occasional papillary outgrowths were seen. Borst regarded this tumor of endotheliomatous origin, the cysts resulting from degeneration.

¹ Verh. path. Gesellch., 1900, ii., 251-253.

GLIOMA. Freundweiler¹ described a rather remarkable example of multiple adult gliomata in the cord in the form of small, circumscribed nodules, more numerous in the gray matter, but without connection with ependyma. Many were softened. Schultze² regards these nodules as artificial. He had occasion to note the development of similar formations in a cord which was frozen solid and thawed.

Herzog³ describes a cerebellar cyst, most likely a persistent diverticulum of the fourth ventricle, the lining of which had undergone an epidermoid cornification—an “atavistic metaplasia.”

Finally, I would mention the occurrence of tuberculosis in gliomata, described recently by Claribel Cone⁴ and Kazowsky.⁵ The latter mentions a similar case by Reich. Kazowsky's growth was situated in the left cerebellar peduncle. His histological description is rather unsatisfactory. Claribel Cone's tumor was nodular and encapsulated, situated in the left temporosphenoidal lobe. Tubercles and tubercle bacilli were demonstrated. The structure of the tumor proper was anomalous, being in parts carcinomatoid, in parts tubular and adenomatoid, in other parts sarcomatoid, and gliomatous—all being reconcilable with the interpretation that the growth originated from misplaced adult ependymal cells.

¹ Virchow's Archiv, 1899, clviii., 64-80.

² Ibid., 583-585.

³ Chicago Clinical Recorder, 1899, xvi., 97-112.

⁴ New York Medical Journal, March 11, 1899, lxix., 331-336 and 403-405.

⁵ Centralbl. f. Path., 1900, xi., 309-311.

LARYNGOLOGY AND RHINOLOGY.

BY A. LOGAN TURNER, M.D.

TUBERCULOSIS OF THE NOSE AND THROAT.

IN 1899 we discussed at some length in Vol. I. of *PROGRESSIVE MEDICINE* the question of tuberculous infection through the pharyngeal and faucial tonsils. It is not our intention to again approach this subject from the same aspect, but rather to examine some of the more recent literature dealing with the infection of the nasal fossæ by tubercle and to describe the clinical picture presented by the same. The whole subject of tuberculous disease of the upper air passages is full of interest, and its important bearing upon general medicine and surgery is self-evident. Various opinions are still expressed concerning the state of the nasal fossæ in health. Does the healthy nose contain micro-organisms? Has the healthy nose any bactericidal power? These questions have sufficient bearing on the subject of nasal tuberculosis to justify us in considering them for a few moments, without, however, attempting any detailed account. Until the importance of making a distinction between the vestibule of the nose and the interior fossæ behind that space was duly emphasized by Thomson and Hewlett,¹ any investigation into the bacteriology of the healthy nose was open to criticism. These observers showed that while the vestibule swarms with organisms, the interior of the nose proper contains a few, but under normal conditions they are never plentiful; a distinct point was, therefore, gained by recognizing this anatomical subdivision. Considerable discussion has also been waged over another point, namely, the part which the nasal mucus plays in the defence of the organism against infection. As far back as 1893 Lermoyez and Wurtz held that the nasal secretion had a distinct bactericidal action upon the majority of pathogenic organisms. While the same view has been expressed by Paget, other investigators in the same field have not been able to confirm it. Thomson and Hewlett, Park and Wright,² and others, while concluding that the nasal mucus is not bactericidal, assert that it appears to inhibit growth,

¹ *Medico-Chirurgical Transactions*, London, 1895, vol. vii.

² *Recherches sur les moyens de defense contre l'infection respiratoire au niveau des fosses nasales*. Bailliere et Fils, Paris, 1900.

or at least does not favor it. Paul Viollet,¹ in a recent elaborate research, has sought to show that the nasal chambers take part in the defence of the organism by the phenomenon of phagocytosis. The leucocytes of the nasal mucus attack the microbes, and it is through their agency that protection is acquired. Straus found tubercle bacilli of a virulent kind in the nasal chambers of individuals who lived among tuberculous subjects. Liaras has repeated the experiments of Straus, and in all of them obtained negative results. We must look forward to the time when these various results will be less conflicting; defects in technique, different methods employed with a similar object in view, and various other circumstances must play their part in a difficult research of this kind. Whatever part the various elements concerned in the protection of the nose may play, and whatever success or non-success may result therefrom, it must, I think, be conceded that the existence of primary tuberculous disease of the nasal fossæ is now an established fact. Tuberculous infection of the upper respiratory passages has been dealt with very fully by Chiari.² In reference to the question of their primary infection, he says that primary tuberculous foci are sometimes found in the upper air passages, in the nasopharynx, in the tonsils, and also in the nose, sometimes also in the pharynx, mouth, and larynx, and in the adenoid vegetations of children in about 5 per cent. of the cases. This primary infection can occur through the inspired air and by means of the infected finger, kissing, etc. Secondary infection of these regions, on the other hand, results from the sputum of tuberculous lungs, and sometimes through the blood-stream in miliary tubercle.

In our remarks upon tuberculosis in this region we wish to exclude all reference to the subject of lupus and draw attention mainly to some interesting facts in the pathology of tuberculosis of the nose other than lupus. A number of facts demonstrate that in spite of the action of the nasal vibrissæ and cilia and the phenomenon of intranasal phagocytosis, tubercle bacilli can enter these cavities and there give rise to tuberculous lesions. The mucosa in many cases may be predisposed by traumatism or by a pre-existing catarrhal condition. Infection may also doubtless be introduced into the nose by the finger of the patient. We find, further, that in a very large proportion of the patients affected with nasal tuberculosis there is an absence of any sign of tubercle elsewhere in the body. On the other hand, post-mortem examination of the nasal chambers in subjects dying from pulmonary or other forms of tuberculosis shows in a striking way how the nose may escape secondary infection. Willigk found the nose on one occasion only affected with

¹ Thèse de doctorat. Bordeaux, October, 1899.

² Berl. klin. Wochenschr., Nos. 45, 47, 1899.

tubercle in 476 post-mortems in subjects dying of tuberculosis. Weichselbaum found nasal tubercle twice in 146 similar post-mortems, while E. Fränkel obtained negative results in 50 patients whom he examined. These figures show a striking contrast to that which we are accustomed to observe when studying the association of pulmonary and laryngeal tuberculosis. In case these figures should convey a wrong impression, it is right merely to note here that individual cases of nasal infection from the sputum of phthisical patients have been reported.

At least two distinct forms of tubercle of the nasal fossa can be recognized, the so-called tuberculous tumor or tuberculoma and the tuberculous ulcer. Both these forms may coexist in the same patient. It is to the tumor variety of the disease that we wish to draw special attention at the present time. Two valuable papers have recently dealt with this subject at some length. Hasslauer,¹ of Wurzburg, in a long paper upon tumors of the nasal septum, devotes a section to tuberculous disease, while in the newly published volume of *Guy's Hospital Reports* Francis J. Steward² records six interesting cases which were met with at that hospital. Both these authors tabulate very fully a large number of published cases. Steward's six cases and ninety-four already published by others since 1889 combine to make a total of one hundred well worthy of detailed consideration. If in the first instance we analyze these six cases recorded for the first time it will be found that five of the patients complained of nasal obstruction, while in the sixth there were no nose symptoms, the lesion being mainly confined to the left orbital cavity. This case, however, is included in the series, as it was found at the operation that the disease, which had commenced in the orbit, had invaded the lateral mass of the ethmoid bone. Objective examination disclosed in four the swelling or tumor, so called, while in the fifth both inferior turbinates were enlarged and showed lobulated masses attached to their inferior borders. These swellings were red in color, firm in consistence, but bleeding somewhat readily when touched with the probe. The surfaces were ulcerated in one or more small areas. In three the growths were attached to the cartilaginous septum, in one both inferior turbinates were affected, in the other the posterior end of the right inferior turbinate was enlarged by a distinct new-growth. When this last case originally presented itself the nasopharynx was found filled with a large swelling, which was at that time removed. In two of the septal cases perforation of the cartilaginous septum occurred, thus adding further evidence of the fact that a perforating ulcer in this locality may be of tuberculous origin. In one of the cases enlarged

¹ Archiv f. Lar., Band x., Heft 1, Berlin, 1900.

² Guy's Hospital Reports, 1900, vol. liv.

tuberculous glands in the neck developed, but in the remaining five there was no other evidence of the disease present. Microscopical examination of the tissue removed revealed in all of them giant cell systems, but in one only were tubercle bacilli found. The difficulty in finding bacilli in these cases has been experienced by most investigators. In Hasslauer's¹ tables, containing eighty cases, tubercle bacilli were found only in twenty; in every case tabulated, however, there was present granulation tissue, with tubercle nodules containing giant and epithelioid cells. Treatment in Steward's cases consisted in curetting, followed by the application of lactic acid. Recurrence took place in two of them. Three of the patients were males and three females, while their respective ages were seventeen, eighteen, thirty-four, thirty-five, thirty-six, and fifty-four years.

An analysis of the 94 cases tabulated by Steward, along with the 6 recorded by himself, brings out some interesting facts. As regards sex, 59 were females and 41 males, thus showing a greater proportion of the former. The majority of the cases occurred before forty, the greatest number being between twenty and thirty years of age. The youngest is reported as being eight months old, while the oldest was seventy-one years. With respect to age, it resembles tuberculosis generally. In 58 the nasal disease is stated to be of primary, in 37 of secondary origin, while in 5 it was doubtful into which of the groups it could be placed. If the observations upon which these figures are based are correct there is abundant evidence of the primary nature of nasal tuberculosis. In nearly all the cases the nasal septum was involved thus demonstrating it to be the seat of selection. In 70 cases the disease affected the septum alone, and if we add to this those cases in which some other part of the nose in addition to the septum was also affected we find that there was septal disease in 89 out of the total of 100. The cartilaginous septum was very frequently perforated. The tuberculous condition showed itself as a non-ulcerated swelling in 40 instances, while in 27 there was ulceration without tumor formation, and in 33 there was either an ulcerated swelling or a swelling in one part of the nose and ulceration in another, thus making in all 73 cases in which an evident intranasal swelling was the prominent lesion. It may reach the size of a walnut or even be larger, occluding one or both nostrils and even projecting from the choanæ behind. Their removal may be undertaken by the knife, the cold snare, curetting and application of lactic acid, and by the use of the cautery. Prota² has described a very interesting case which he reports under the title of "tuberculous vegetations of the nose." The patient was seventy years of age, and had frequently suf-

¹ Op. cit.

² Arch. ital. di lar., 1900, No. 1.

ferred from nasal catarrh—a condition which had become much aggravated and accompanied by a muco-purulent discharge during the last year. This was followed by complete nasal obstruction and the appearance of red, fleshy masses at the anterior nares. These were of a firm but elastic consistence; some were pedunculated, others sessile, and they were attached to both sides of the cartilaginous nasal septum and also at the level of the junction of the floor and septum. There was no ulceration. The posterior nares were free from the disease, but the uvula was in part destroyed and the soft palate was infiltrated with small, miliary-like nodules. There was lupus of the face in the region of the left ear. There were no physical signs in the chest and no bacilli found in expectorations. The patient's mother, who died young, had had a tuberculous osteitis. The patient herself had been treated with hypodermatic injections of corrosive sublimate with a negative result. She reacted to the tuberculin test. The polypoid masses were removed and examined microscopically. They contained giant cell systems, but no tubercle bacilli were found, and inoculations on animals gave negative results. Recurrence of the masses took place, necessitating a second removal.

Ferreri has been struck by the fact that members of the teaching profession appear especially prone to tuberculous infection. His remarks refer chiefly to personal observations made at his clinique in Rome. He states that 79 per cent. of school teachers die from tubercle, and he has been able to corroborate the frequency of this infection, especially in the female sex. Certain factors predispose to throat affections, and these in turn may prove a possible source of further mischief. Ferreri¹ quotes the observations of E. S. Yonge, who compiled statistics from the examination of seventy governesses employed in eight boarding schools and eight of the Board schools of Manchester. In no fewer than sixty-five of these persons he found evidence of pharyngeal and laryngeal affections, and in addition to the facts he further found a good deal of phthisis in the same class. Ferreri is inclined to blame the neglect of proper hygienic precautions, and that there is not enough done for the physical comfort of the teachers. It is probable, too, that the simple throat affections are to some extent due to improper voice production: defective costal respiration, a neglect of buccal articulation, and the necessity of requiring to speak against loud noises are important predisposing factors. An examination of his notes made during a period of five years revealed the fact that out of the sixty-five female teachers twenty were affected with tuberculous lesions of the respiratory tract, while in two only was a pulmonary affection present. There is thus a

¹ Ann. des Malad. de l'oreille, Paris, January, 1900.

striking disproportion between the frequency of the affection in the upper respiratory tract and in that of the lung itself. The greater number of female teachers affected is probably accounted for by the fact that the governesses exceed the male teachers in Rome almost in the proportion of three to one. The death-rate, however, is in no proportion to the number of cases observed, demonstrating the fact that the lesion does not pass on to a fatal issue. Ferreri condemns the hygiene in the class-rooms of the primary schools, into which neither light nor sun obtains admission, and he contrasts them with many of the schools in Sweden, where gardens surround the schools. He considers that more attention should be paid by the municipal authorities to prophylaxis; that light and air should be increased; that the walls and floors of the room and corridors should be paved with cement, admitting of better disinfection; that all gymnastic exercises should be conducted in courtyards or elsewhere, so that the dust of the rooms is not unnecessarily raised and the organisms disseminated in this way; special provision should also be made for preventing indiscriminate expectoration. As soon as a tuberculous lesion is suspected in a teacher the secretion should be carefully examined for tubercle. When such a lesion is proved to be tuberculous and is eventually cured, no further teaching should be permitted until a year elapses after the completion of the cure.

EPISTAXIS.

It is quite unnecessary at this date to draw attention to the fact that the seat of election of intranasal hemorrhage is the anterior and inferior part of the cartilaginous septum.

Its situation and the ease with which it can be observed and the necessary treatment applied by the aid of anterior rhinoscopy renders its cure by means of the cautery a very satisfactory procedure. This, however, is not the only site of intranasal bleeding, and recently attention has been drawn by Brown Kelly,¹ of Glasgow, to a hitherto unrecognized source of hemorrhage, namely, from the anterior ethmoidal vessels. As the recognition of the true source of the bleeding in these cases has an important bearing upon the treatment of the same, Kelly's observations are worthy of detailed study. Four cases are recorded in which the hemorrhage evidently took place from the roof of the nose or from the septum above the anterior end of the middle turbinate. In all the cases the bleeding was severe, and the attacks recurred at intervals. Examination of the interior of the nose showed in three of the cases the blood flowing from above the anterior end of the middle turbinate,

¹ *Lancet*, London, February 24, 1900.

while in the fourth the cessation of the blood flow, after the introduction of a suitable plug between that bone and the septum, indicated that in this case, too, the bleeding took place from the same locality. Additional evidence was forthcoming in two of the cases from the fact that the stream was observed to descend over the septum. That the bleeding was of venous origin rather than arterial was suggested by the fact that in one case the onset occurred when the patient was asleep; in another, when he was stooping; in a third, while the patient was lying quietly in bed, and in the fourth during the act of washing the feet.

It is interesting to follow Kelly's inquiry into the possible etiology of epistaxis from this source. The anterior ethmoidal veins, which are not the largest in the nose, are situated high up in the most secluded and best protected part of the cavity, and, therefore, from their position no reason can be found to explain their tendency to bleed. They differ, however, from the other veins of the nose in their close connection with the intracranial circulation, and it is in this point that the writer seeks to find explanation of the profuse and prolonged hemorrhage in the cases which he has reported. The ethmoidal veins anastomose with the veins of the dura mater and with the superior longitudinal sinus. These veins can be injected from the longitudinal sinus, thus proving the absence of valvular obstruction to a backward flow. This fact, taken in conjunction with the blood-pressure in the sinus, which has been shown by Leonard Hill to follow closely the general circulatory pressure, would allow of abundant hemorrhage from the proximal end of a ruptured ethmoidal vein. This connection between the nasal and intracranial veins would explain the sense of relief in the head which is sometimes felt after bleeding from the nose.

The practical application of Kelly's observation is found in the mode of inserting the plug in order to control the bleeding. This should be done by firmly packing the gauze strip into the interval between the septum and the anterior end of the middle turbinate, carrying it as near to the roof of the nose as possible. Such a plug serves the purpose, while the lower part of the nasal fossa is thus left free, so that respiration may go on unimpeded. This increases the comfort of the patient in a marked way, and it further renders unnecessary that most disagreeable operation of plugging the posterior nares. The packing may be changed once or twice at intervals of a day, or, if it can be introduced without becoming saturated with blood, it may be left in for two days, and then finally withdrawn if all tendency to hemorrhage has ceased.

THE NASAL ACCESSORY SINUSES.

The study of the bacteriology of inflammation of the accessory sinuses is yearly receiving more attention, and a number of organisms have now been found by various observers in connection with diseases in these cavities. The majority of rhinologists are perfectly well aware of the clinical fact that the pus which is secreted in these sinuses does not always present the same physical characters; in some cases examination of the nose reveals the presence of a yellow, thick, creamy pus, while in another instance it is thinner and more mucoid in character; again, the secretion may be of a fetid nature in one case, while in another no odor can be detected. A knowledge of these facts naturally raises the question as to how far they may prove of any diagnostic or prognostic value. One of the most recent investigations into the bacteriology of the sinuses carried out by Stanculeanu and Baup¹ has been undertaken mainly with this end in view. A number of cases of chronic maxillary, frontal, and fronto-maxillary suppuration were studied by these authors, and the results which they have obtained are not devoid of interest and should stimulate to further research upon similar lines. It is not my intention to describe in detail the methods which were employed by these workers or the characteristics of the organisms found, all of which can be much better studied in the original text. The greatest care was taken to avoid every source of possible error.

Twelve cases of chronic antral suppuration were in the first instance examined. By a careful clinical study it was found possible to subdivide these into two groups. Ten of the cases were clearly of dental origin; in all of these the patients had suffered from caries of one of the upper molars or from alveolar periostitis or abscess. It was further observed that in all of them the pus had a markedly fetid odor. It was found in those ten cases possessing these two clinical features that the pus contained a number of anaërobic organisms which were responsible for the fetor and which were found associated with aërobic varieties. In only two of the cases could the special fecal odor be ascribed to the presence of the bacterium coli. It will perhaps not be out of place here to indicate briefly what is meant by anaërobic and aërobic germs. Certain bacteria will grow only when there is no oxygen present; these are spoken of as anaërobic germs; others, again, will live and grow only when oxygen is present; they are the aërobic organisms. There are, again, certain bacteria to which the presence or absence of oxygen is a matter of indifference. As examples of various anaërobic bacteria we may mention the bacillus ramosus, bacil-

¹ Archiv internat. de Lar., 1900, No. 3.

lus perfringens, *bacillus serpens*, *fragilis*, and *thetoïdes*, as these are more directly concerned in the subject now under discussion. Of aërobic organisms we may for the same reason make mention of the pneumococci, staphylococci, streptococci, and pneumobacillus. We have still two antral cases out of the twelve investigated to refer to; in them the infection was probably of nasal origin, as the purulent discharge in each supervened upon a violent coryza, and the teeth in both patients appeared perfectly sound. In neither of them was the pus fetid, and it was more mucoid and ropy than of the nature of thick pus. Streptococci and pneumococci were found.

Three cases of frontal sinus suppuration of undoubted nasal origin were next examined; in them the pus showed the same physical characters as were found in antral cases of nasal origin. Bacteriologically also similar results were obtained, the pus containing streptococci and pneumococci. In one of the cases there was found in addition Friedländer's pneumobacillus and a small colony of *bacillus perfringens*.

Two cases of fronto-maxillary suppuration on the same side were also examined, so that pus from both cavities was obtained at the operation, and the results compared. The authors draw the following deductions from their examination: In one of the cases the pus in both the cavities was very fetid and contained both anaërobic and aërobic organisms in considerable quantity, the *bacillus ramosus*, *bacillus perfringens*, and pneumococci. In this case they conclude that the disease was primarily antral, originating in carious teeth, and that it had spread through the medium of the ethmoid cells to the frontal sinus. In the other case there was an absence of fetor in both the cavities, and only staphylococci were found. There was no dental lesion, and the affection followed an acute coryza. In all probability the frontal sinus had in the first instance become infected, and from it the pus had drained into the antrum.

That the antrum in this case served as a receptacle was demonstrated by the fact that a histological examination of its mucous membrane showed it to be almost perfectly normal, while that of the frontal sinus was in a polypoid condition. I would venture, however, to criticise this deduction. There is no reason why both cavities should not have been infected simultaneously. One meets with the fungus or polypoid condition of the frontal mucosa relatively more frequently than in the antral lining membrane, and its absence in the latter cavity does not imply the non-existence of a chronic suppuration of antral origin and of considerable duration. This, however, does not affect the main issue which we are at present considering.

From the evidence thus brought forward it is clear that two subdivi-

sions may be made on bacteriological grounds, namely, an inflammation of dental and another of nasal origin, although exceptions must necessarily arise, while proof may be wanting in every case.

THE MAXILLARY SINUS.

Treatment by Lavage. Various tubes and obturators have from time to time been introduced to the notice of the profession for the purpose of assisting in antral treatment through the alveolus. One of the most recent of these certainly has claims to favorable notice, if for no other reason than that it permits of syringing being carried out with greater comfort to the patient. The apparatus consists of five portions : (1) A borer, which is of special size and shape and which cuts the bone of the alveolus very readily, when rotated forward from left to right, because of the fluting or grooving of its edges. (2) A measurer, which is used to ascertain the depth of the bone traversed before the floor of the antral cavity is reached ; in this way the tube which is afterward inserted can be cut to the desired length. (3) A tube-carrier—a modified screw-driver—on which the antral tube fits, and by means of which the latter is screwed into the hole made by the perforator. (4) An antral tube, which is made of silver gilt and which is screwed into the hole made by the perforator. It has a screw-thread upon its outside and a slot on its flanged end like a screw-head ; it is, in fact, a hollow screw, which fits on the tube-carrier the same as a canula does upon a trocar. This tube is worn by the patient during the whole time of treatment, and is provided with a split-pin stopper to keep the food from passing into it. One length is supplied, which is usually satisfactory in most cases, though in young subjects it may be necessary to saw a portion of it off. (5) A two-way nozzle, which exactly fits the permanent antral tube and is used when the cavity is syringed. It has a longitudinal septum in it, so that there is an inlet and exit for the fluids when the antrum is washed out. To the inlet branch there is attached a modified Higginson syringe, and to the exit a piece of rubber tubing, which passes into the basin which receives the fluid. This latter arrangement conduces to greater cleanliness during the act of syringing, as it prevents all discomfort and annoyance from the trickling of the lotion on to the hands or clothes of the patient. The apparatus was devised by Ackland,¹ dental surgeon to the Bristol Infirmary. The removal of a tooth, boring of the hole, and insertion of the antral tube can all be carried out under one administration of gas. In this way everything can be suitably adjusted at one sitting and the treatment commenced at once.

¹ British Medical Journal, June 2, 1900.

The Radical Operation. As there is apparently a greater tendency among rhinologists at the present time to carry out what is known as the Caldwell-Luc operation in cases of chronic maxillary suppuration, and as in some instances the description of the steps of this operation differs, it will not be out of place to review here Luc's¹ most recent account of this operation. Its main features consist in the opening and curetting of the antral cavity through an intrabuccal incision and removal of the facial wall of the sinus, followed by the establishment of an artificial opening in the nose and the immediate closure of the buccal incision by sutures. If the operation is studied in detail we find that after the upper lip has been everted an incision is made through the mucous membrane down to the bone, a few millimetres below the line of junction of the alveolar mucosa with the cheek. It is commenced behind at the level of the first molar tooth, and is carried forward as far as the canine. If this incision is made somewhat below the mucous fold the introduction of the sutures is facilitated. Its prolongation forward as far as the canine ridge permits of the exposure of the line of junction between the facial and nasal walls of the sinus—a point which assists in the making of the opening into the nose. The soft parts, along with the lip, are then retracted by means of a periosteum elevator, and the anterior facial wall is opened as high up as possible by means of a gouge and mallet. This opening is then enlarged by the gouge or with cutting forceps, as large an aperture as possible being made, extending as far as the floor of the sinus below and up to the junction with the nasal wall mesially. By this latter step the artificial opening through the nasal wall of the sinus is more easily performed. Externally, too, care should be taken to enlarge the aperture, on account of the frequency with which polypoid thickening of the mucous membrane occurs in the outer angle of the cavity. If the finger can be admitted for purposes of palpation, and if a good light can be thrown in so as to aid inspection, the sinus can be thoroughly explored. It is now necessary to curette its interior and remove the thickened polypoid lining membrane. Luc has found that this condition of the mucosa is found more especially on the inner or nasal wall in the region of the ostium maxillare—upon the floor between the projections that may be formed by the teeth roots and about the outer part of the anterior wall. During this procedure strips of gauze are used for mopping and cleaning, and sharp spoons fixed at an angle to the handles should be employed so as to reach such parts of the cavity as cannot be attacked with a straight spoon. After the sinus has been thoroughly dried by plugging,

¹ *Leçons sur les suppurations de l'oreille moyenne et des cavités accessoires des fosses nasales*, Paris, 1900.

and again carefully inspected and palpated, it is swabbed out with a strong solution of chloride of zinc (1 in 10 or 1 in 5), and dusted with iodoform powder and plugged with a strip of gauze. This latter assists in absorbing the blood when the artificial opening into the nose is made.

The next step in the operation consists in making the aperture. The anterior part of the nasal fossa is in the first instance plugged with gauze so that the septum may not be injured by the chisel. By means of the gouge and hammer the anterior inferior third of the bony nasal wall is removed from its antral aspect. When this has been done and the nasal mucous membrane comes into view, the latter is removed with the knife and forceps along with the anterior half of the inferior turbinated body. The author favors a large opening in this situation, as it insures free drainage and it is not attended with a risk of rapid closure, as is apt to be the case if only a small communication is made. The operation is now completed by carefully plugging the whole antral cavity from the buccal wound with a strip of iodoform gauze, one end of which is brought through the nasomaxillary opening, so that it can be extracted by this route. The incision in the mucous membrane of the mouth is then sutured by means of catgut threaded upon a slightly curved needle. Care should be taken that the food does not lie in contact with the wound, the fluid or semi-solid nourishment given during the first two days being administered in a spoon. On the third or fourth day the incision is probably healed. On the fourth or fifth day after the operation the gauze is extracted from the cavity through the nose. One can then leave the patient without any further treatment, as the large opening between the nose and the sinus permits of any abnormal secretion in it being blown out by means of the handkerchief. As a rule, however, during the next four or six weeks the cavity is occasionally washed out through a Eustachian catheter passed into it from the nose. If an interval of five or eight days is allowed to elapse after one syringing, and the lotion is then found to return quite clear, one may consider that the cure is complete.

When the antral cavity is alone affected, and when no ozænic condition of the nose coexists, Luc has found this method of operating a very successful one. Should there be any coexisting nasal condition likely to cause reinfection of the cavity, it would not be indicated unless one could be satisfied that a simultaneous cure of the other affected sinus was also possible. The above procedure is urged on the ground that the immediate closure of the buccal wound reduces the risks of reinfection of the cavity to a minimum, does away with after-treatment through the mouth, and makes the patient's condition a much pleasanter one at once.

THE FRONTAL SINUS.

Last year I entered at some length into the question of chronic suppuration of the frontal sinus, and I must refer the reader to *PROGRESSIVE MEDICINE*, Vol. I., 1900, for a more extended description of this affection. At this time I would rather draw attention to our present-day view with regard to the treatment of chronic suppuration in this cavity. The tendency among operators now is to establish a free communication between the sinus and the nose, and in doing so to remove all disease in the latter situation, so as to prevent reinfection of the sinus from such a source. The great frequency of associated anterior ethmoidal cell suppuration renders this necessary. In establishing free drainage into the nose we at the same time seek to get rid of the diseased ethmoid cells. In order to accomplish this, combination, so to speak, of the intranasal and extranasal operation is carried out—that is to say, the anterior portion of the middle turbinated bone and certain of the ethmoid cells are removed through the nose at a preliminary operation, and subsequently the frontal sinus is opened from without, and the sharp spoon is passed downward through the floor of the sinus and an attempt made from above to deal with the rest of the disease in that area. Another point which calls for some remark is the post-operative treatment in these cases. The introduction of a drainage-tube between the sinus and the nose or the insertion of gauze packing between the same cavities no longer meets with general acceptance. Indeed, to establish a direct connection by such means as tubing or gauze between a cavity which one has done everything to render aseptic and the vestibule of the nose is, to say the least, hardly good surgical practice. When the sinus is packed with gauze the end should be brought out through a skin wound on the forehead, which is properly protected with antiseptic dressings. The exact method of doing this, however, varies in different hands.

Herbert Tilley¹ has recently published some very successful results of surgical treatment of chronic suppuration. The method of operating adopted by him is, briefly, as follows: In the first place, the anterior part of the middle turbinated bone is removed, and all polypi, granulations, and diseased bone snared and curetted through the nose. After this has been done the external operation is performed. As a preliminary precaution the posterior nares, or, at any rate, the choana of the same side, are plugged so as to avoid the risks of a free flow of blood backward into the air passages. An incision is made along the inner two-thirds of the supra-orbital margin, just below the line of the eye-

¹ *Lancet*, London, July 14, 1900.

brow and commencing above the internal palpebral ligament. The soft parts and periosteum are retracted and a small disk of bone is removed from the anterior wall of the sinus. When the cavity is small, and especially if the patient is a male, he removes the whole anterior wall, so that at the end of the operation the soft parts fall in against the posterior wall and obliterate the sinus. On the other hand, if the sinus is large, only a limited area of bone is removed, otherwise very considerable deformity would follow. The interior of the cavity is curetted, all its recesses being carefully explored; a free opening is next made into the nose by means of curved burrs of progressive sizes or with a suitable curette, the size of the communication being at least sufficiently large to admit an ordinary lead-pencil. The suppurating anterior ethmoidal cells are at the same time destroyed. Access to the lower part of the cavity is facilitated by removing a portion of the anterior wall of the sinus just above the fronto-nasal suture. The cavity is swabbed with pure carbolic or chloride of zinc (40 grains to 1 ounce) and then packed with a strip of antiseptic gauze, its end projecting at the lower angle of the skin incision. The rest of the wound is then accurately stitched and a dressing and bandage applied. If the temperature remains normal and the wound quiet on the third or fourth day, about three inches of gauze are removed and cut off, and this process is repeated at intervals of three or four days until all is removed and the cavity is lined with granulation tissue. The external wound is then allowed to close completely. Of fourteen cases treated by Tilley eleven underwent the external operation. One case terminated fatally from chronic septic osteomyelitis. This was one of the earlier ones operated on, and he ascribes it to imperfect opening into the nose and to closely stitching the external wound. Suppuration recurred and invaded the freshly open diploe. Eight resulted in a cure, while in two some discharge still continued from the sinuses.

In Luc's¹ monograph the same principles are carried out, but the operation is not completed as we have above described it. It is true that he has now ceased to use the drainage-tube between the sinus and the nose, but instead of that he has substituted a strip of gauze. Instead of bringing the end of the tampon, which fills the sinus, out at the forehead wound, which is completely closed, he draws it down to the entrance of the nasal fossa and leaves it there for two or three days. It is then readily withdrawn from the sinus by this route. We have already expressed our own view upon this latter procedure.

¹ Op. cit.

MALIGNANT DISEASE OF THE LARYNX.

It will not be out of place at this time to carefully examine some of the more recent literature bearing upon the subject of malignant disease of the larynx. Examination of the medical journals of to-day shows that a lively interest is maintained upon this subject—an interest which is certainly demanded by the great clinical importance of the disease. At the Twelfth International Medical Congress, held in Moscow in 1897, cancer of the larynx was discussed in relation both to diagnosis and treatment, while at the Thirteenth Congress, held in Paris in 1900, the same subject again came up for discussion. At the Spanish Congress of Otology, Rhinology, and Laryngology, held in Barcelona in September, 1899, and at the Annual Congress of the American Laryngological Association, held in May, 1900, cancer of the larynx was also the subject of debate, thus still further demonstrating its wide-spread interest and the conviction in the minds of laryngologists of the necessity of carefully sifting all the facts which ripened knowledge and experience can bring together. At the outset it will be better to clearly state that no differentiation will be made here between cancer and sarcoma of the larynx. The term malignant disease will include both, and if the word cancer is employed it will be in the sense of being synonymous with malignant growth. Attention will be devoted mainly to two points—diagnosis and treatment—and in studying the statistics of results of operative interference the important question of prognosis must necessarily be dealt with. Prognosis and treatment of laryngeal cancer are so much dependent upon early accurate diagnosis that we must in the first place turn our attention to this side of the matter.

An anatomical rather than a pathological classification of malignant disease of the larynx is of the greatest importance, and is one which is not always sufficiently recognized. The subdivision of laryngeal cancer into extrinsic and intrinsic is one of great clinical importance. By extrinsic we mean the attachment of the growth to the epiglottis, the aryepiglottic folds, the interarytenoid fold, and the cartilaginous framework of the larynx. The disease is intrinsic when it grows upon the ventricular bands, the true cords, the ventricles of Morgagni, and from the larynx below the cords. There is a marked clinical distinction in relation to this anatomical classification which is of undoubted therapeutic value. Intrinsic cancer is of slower growth and is more of a local disease, the lymphatics becoming affected only late in the disease; while the extrinsic form is of shorter duration and spreads more rapidly to neighboring parts, while the lymphatics become involved at an early period. The importance of these facts will be better appreciated when

the subject of treatment is under discussion, but ignorance of them may lead to errors in diagnosis.

Treatment. It is not my intention to place before the reader an exhaustive account of the treatment of malignant disease of the larynx. Even to attempt to do so would be outside the scope of a paper of this kind. I shall rather attempt to emphasize one or two points in the light of more recent literature and then quote some of the statistics that have been published upon post-operative results. There is no doubt, as already indicated, that early diagnosis is one of the important factors which so favorably influences treatment. Further, the kind of operation that is performed and the improvements in the technique employed are also responsible for the same result. It will not be out of place, perhaps, to refer in the first instance to a paper by B. Fränkel¹ upon the endolaryngeal treatment of cancer. This author may be regarded as the exponent of this method of dealing with the disease, and on more than one occasion has expressed favorable views toward the procedure. He holds that in certain cases it is possible to remove all the disease and to operate in the surrounding healthy tissue; where this is not possible, then an operation *per vias naturales* is not indicated. The operation is without danger; the patient is not required to lie up in consequence of it; the voice is not lost. The smaller the tumor the more suitable is the case for such a procedure; but during a period of six years Fränkel only twice had an opportunity of performing the operation. He quotes the following statistics with regard to nine cases treated in this way. Where the term cure is applied to cancer of the larynx it is generally understood that the patient has manifested no evidence of the disease during a period of three years. We find, therefore, in Fränkel's case that four remained free from disease for a longer period than this, namely, during thirteen, ten, nine, and six years respectively, while one had shown no recurrence at the end of one and a quarter years. Of the remaining cases, two later on required thyrotomy, one of them dying of glandular recurrence; while the other had a fatal apoplexy two years later, the larynx at the time of death being free from the disease. Of the remaining two, there was no further information regarding one of them, while the other died from laryngeal cancer four years after the endolaryngeal operation, the patient submitting to tracheotomy only as a further means of treatment. Although these results are certainly favorable, probably most laryngologists would consider the procedure a bad one and would advocate the external operation. As several sittings are required for endolaryngeal treatment, and as these are carried over a considerable period of time, the risks of further infection and the

¹ Archiv f. Lar., Band vi., Heft 2, Berlin, 1897.

danger of exciting in the tumor an increased local growth are considerable. There is no guarantee that all the disease comes under the eye of the observer, so that even a small growth—and this is a condition which Fränkel stipulates for—may be larger and infiltrate more deeply than is apparent.

It is now necessary to consider the question of an external operation for malignant disease of the larynx, and in doing so we wish specially to draw attention to the operation designated as thyrotomy or laryngofissure. It is mainly to the work and teaching of Semon¹ and Butlin² in London that this operation is becoming more extensively employed than formerly, and the latest writings of these authorities are both valuable and instructive. I have already pointed out the distinction between extrinsic and intrinsic laryngeal cancer, but refer again to this subdivision here in order to emphasize once more the importance of recognizing this anatomical basis. Further, when treatment is under consideration, the intrinsic variety does not tend to early lymphatic involvement or to readily attack the cartilaginous framework of the larynx. Bearing in mind these facts, we can better appreciate the reasons given for operating in this way. Moreover, the end justifies the means, as the statistics after thyrotomy clearly show. Semon in discussing treatment points out how, by the intralaryngeal method, too little is done; while total extirpation, on the other hand, in so many cases means doing too much. Facts and experience prove that in thyrotomy we have a valuable intermediate course, which, on the one hand, avoids the risk of setting up that local irritation in the growth which may follow an incomplete operation (endolaryngeal), and, on the other hand, avoids any mutilation of the patient (total extirpation). Mackenzie,³ in the paper which we have already quoted, appeals for much more radical measures than can be satisfied by a simple thyrotomy. He considers that in the majority of cases there is only one rational method of dealing with malignant disease of the larynx, and that is the total extirpation of the entire organ, with its tributary lymphatics and glands, whether the latter be apparently diseased or not. So long as there are lymphatics to carry the infection, and glands to receive it, so long will the patient be subjected to ultimate danger. "Thyrotomy with curettement," he says, "or removal of all apparent (visible) disease, is not up-to-date surgery, is in direct defiance of the rules that should govern us in the treatment of cancer, and is a reversion to and a resurrection of a method of procedure that was discredited and abandoned over half a century ago."

¹ Monats. f. Ohrenheilk., Berlin, November, 1899; Encycloped. Med., vol. v., Edinburgh, 1900; Section of Laryng., Thirteenth Internat. Med. Cong., Paris, 1900.

² Operative Surgery of Malignant Disease, 2d edition, London, 1900.

³ Op. cit.

In other words, he seeks to apply to this organ the same surgical principle which governs the treatment of cancer elsewhere in the body. After perusal of the writings of Semon and Butlin, and after considering the statistics of thyrotomy which they submit, we are unable to support the sweeping measures advocated by Mackenzie when the treatment of intrinsic laryngeal cancer in its early stages is the point at issue.

As the operation of thyrotomy for malignant disease owes its present status largely to the improvements in technique introduced by Butlin, we take the liberty of quoting at some length the operation as described in his recent work on *The Operative Surgery of Malignant Disease*: "The patient is anaesthetized, the shoulders and neck are raised, and the head is thrown back. The skin is prepared as for any other operation. An incision is made from the hyoid bone down almost to the sternum in the middle line, and the structures are divided right down to the thyroid cartilage and the trachea, including, generally, the isthmus of the thyroid gland. The vessels—for the most part veins—are clamped. The trachea is freely opened below the cricoid cartilage and Hahn's tube, with its sponge covering, is introduced." Thus ends the first part of the operation, for ten or twelve minutes must be allowed to elapse before the larynx is opened, in order to allow the swelling of the sponge completely to occlude the trachea and thus prevent the descent of blood and other liquids into the air passages. During this interval the clamped vessels should be ligatured and the upper part of the wound should be kept covered with gauze.

At the expiration of the ten or twelve minutes the thyroid cartilage is split in the middle line from below upward. This is important, for as the cartilage is generally calcified and requires the use of bone forceps, the inner blade of the forceps, working from above downward, may slip or detach one of the vocal cords at its anterior extremity. If the growth proves, after all, to be innocent, and does not call for the removal of any part of the vocal cords, such an accident results almost certainly in permanent injury to the voice. The crico-thyroid membrane is divided down to the cricoid cartilage, and the incision is carried up beyond the level of the upper border of the thyroid cartilage, in order to gain as much space as possible, but it is desirable not to interfere with the attachment of the epiglottis unless the situation of the growth makes this imperative. The two alæ of the thyroid cartilage are held widely apart by means of silk threads passed through each, the interior of the larynx is sponged out dry, and is then brushed with a 20 per cent. solution of cocaine. The oozing of blood soon ceases, when the interior of the larynx is very carefully examined, generally by reflected light with a mirror on the forehead, and the extent and exact situation of the disease are made out. An incision is carried

around it with knife or scissors, including more than half an inch of the surrounding apparently healthy tissues, without respect to the after use of the voice or any other consideration except the complete removal of the disease. The included area is cut out right down to the cartilage, which is laid bare and finally scraped absolutely bare with Volkmann's sharp spoon. The cavity is plugged with iodoform gauze, upon which pressure is made for two or three minutes. By this means the bleeding, which is never serious, is checked. The gauze is then removed and the surface dusted with powdered iodoform. I have not used the galvanocautery to the interior of the larynx for some years past, and I have never seen bleeding which could occasion the least anxiety. If a small vessels spouts it should be ligatured with the finest catgut. The alæ of the thyroid cartilage are now brought together with a couple of silk or silver sutures and are as carefully apposed as possible; the Hahn tube is taken out, and the edges of the wound in the soft parts are brought together except at the lower part where the tube was inserted. I think it is much safer to leave this part open, in order to provide for the ready escape of blood and other liquids from the larynx and trachea and to guard against cellular infiltration underneath the skin. In order to hasten the convalescence some operators have lately closed the entire wound; but I am very much opposed to such a practice, which aims solely at shortening what is really a very short after-treatment, and does so with decided risk to the patient.

I have devoted considerable attention to the after-treatment of these operations, which is now conducted on the following lines: Hahn's tube is removed as soon as the operation is concluded, and no tube is employed in its place; the wound is covered with a piece of mercurial or iodoform gauze, and this, which is kept in place by means of a single turn of bandage, is changed by the nurse as often as it is soiled. The patient is placed on his side, with only a single flat pillow for his head, which is placed well forward, so that all liquids have a tendency to pass out of the air passages, especially through the external wound. During the day of the operation nothing is swallowed, although fragments of ice may be kept in the mouth for the comfort of the patient. If there is fear of collapse and the patient is feeble or very old, brandy and beef-tea may be administered by the rectum. On the following morning the first attempt is made to swallow. The patient leans far forward, with the head down, and the dressing is taken off the wound, beneath which a basin is placed. Cold water is drunk out of a glass. If the experiment is successful all the water passes down into the stomach; if it is only partially successful some escapes into the larynx, but the posture of the patient ensures that it runs out through the wound and does not pass into the air passages. As soon as water can be readily swallowed,

milk, beef-tea, and other liquids may be drunk, for the fear of "schluck-pneumonie" is practically at an end. The wound is generally closed within ten or twelve days after the operation, and the patient is rarely confined to the house for more than ten days.

This description applies only to those cases in which the disease is limited to the soft parts of the larynx, and is of small extent. In other cases the operation may need to be modified even to the extent of removal of a large part or the whole of the framework of the larynx; or the operator may find on examination that the patient is not likely to be benefited by an attempt to remove the disease, and may then decide to abandon the operation, contenting himself, perhaps, with introducing an ordinary tracheotomy tube for permanent wear.

Iodoform powder may be insufflated into the larynx during the first days after the operation, either through the mouth or through the wound by means of an insufflator with a bent nozzle.

The subject of statistics must be considered under two heads: first, recovery from the operation; secondly, recovery from the disease, the term "cure" implying that no recurrence has been observed three years after the operation. When an attempt is made to compare statistical tables, considerable difficulty is encountered, as in many instances no differentiation is made between intrinsic and extrinsic varieties, and in compiling tables there is not always sufficient discrimination made between cases operated upon before and during the last decade—that is to say, before and after the introduction of improved technique. We shall, in the first place, consider Semon's¹ statistics on thyrotomy for intrinsic cancer, drawing attention to the fact that in two of the cases a portion of one arytenoid cartilage was also removed. The cases occurring in his private practice and operated upon by himself were fifteen in number. The mortality from the operation was one. This patient was seventy-two years of age, and had suffered from chronic bronchitis for twenty years. He died six days after the operation. With regard to the question of recurrence and cure, the appended table shows the very satisfactory results obtained. Only ten are quoted, because of the fifteen one died after the operation, one had been operated upon only three months before, in one the growth was certainly benign, while in another there was some doubt as to its nature, and the fifth possibly showed evidence of recurrence.

¹ Monats. f. Ohrenheilk., Berlin, November, 1899.

Malignant disease.	Living after operation without recurrence.			
1.	6	years and 5 months.		
2.	7	" "	4	"
3.	4	" "	5	"
4.	3	" "	8	"
5.	3	" "	2	"
6.	3	" "	3	"
7.	2	" "	5	"
8.	1	year	4	"
9.	1	" "	4	"
10.	1	" "	3	"

With the exception of Case 5, which died suddenly from embolism, all the other patients are alive and in good health. None of them is wearing a canula. In six the voice is excellent; two speak with a husky, weak voice, which, however, is better than it was before the operation; one who had both vocal cords completely removed can make himself understood in a whisper. The mortality from the operation in Semon's cases is, therefore, 6.6 per cent. In his experience, if recurrence has not taken place one year after the primary removal of the disease it is then as little likely to do so as after the lapse of three years. Hence the ten cases tabulated may be regarded as "cures," thus giving Semon the excellent percentage of 83.3 successful results after thyrotomy.

If we turn now to Butlin's¹ statistics after the same operation we find that he and Semon prior to and including the year 1896 had performed thyrotomy seventeen times for intrinsic cancer; two deaths followed the operation, one due to sepsis, the other to bronchitis. Since 1896 they had lost no case from the operation, having performed thyrotomy ten times. The diminution in the mortality is considered by Butlin to be due to the improved methods and to the better after-treatment, such details as the immediate removal of Hahn's tube, the frequent changing of the dressings, and care in feeding being responsible for the results. With regard to the question of "cure," sufficient time had not elapsed to permit him to tabulate his results in this connection since 1896, but at the date of publication of his book (1900) no deaths had so far occurred. These figures, therefore, show clearly enough that in the hands of Semon and Butlin thyrotomy has furnished very successful results in the treatment of malignant disease of the larynx.

Sendziak,² whose labors in the compilation of statistics in this field of work have been enormous, has again furnished us with a large series of facts and figures. His investigations have allowed him to tabulate the operative results in 640 cases. I have endeavored to put them into

¹ Op. cit.

² Monats. f. Ohrenhk., Berlin, September, 1899.

a simple tabular form. The statistics cover two periods of time: first, from earliest times to 1888; secondly, from 1888 to 1898, but excluding the year 1898. Further, the statistics are considered under five different headings: (1) Cure—that is, no recurrence three years after the operation; (2) relative cure—that is, no recurrence one year after the operation; (3) recurrence; (4) deaths immediately dependent upon the operation (within the first fortnight); (5) cases observed for too short a period to permit of any definite statements being made concerning them. The operations, the results of which are examined, are (*a*) endolaryngeal removal, (*b*) thyrotomy, (*c*) partial excision, and (*d*) complete excision of the larynx. In the following table the results of these operations are given:

Operation.	FIRST PERIOD UP TO 1888.						SECOND PERIOD 1888-98 (EXCL.)				
	Cases.	Complete cure.	Relative cure.	Recurrence.	Death after operation.	Incomplete observation.	Complete cure.	Relative cure.	Recurrence.	Death after operation.	Incomplete observation.
Endolaryngeal	36	5	1	17 cases 7	0	0	4	4	19 cases 7	0	11
Thyrotomy	136	2	2	58 cases 55	3	0	15	15	78 cases 23	9	16
Partial excision	201	7	4	55 cases 19	18	0	19	16	146 cases 44	26	27
Complete excision	267	8	9	143 cases 51	56	0	4	15	124 cases 30	38	32

I am unable from a perusal of his paper to make in every case the several columns of figures agree with the totals given.

Sendziak draws the following conclusions from these figures:

1. That in the present state of our knowledge concerning laryngeal cancer, operation is the only warrantable treatment.

2. Operation gives very favorable results when performed in the earliest stages of the disease—a state of affairs now made quite possible with the improved methods of diagnosis.

3. That thyrotomy is one of the most successful methods of operating, also partial or unilateral resection of the larynx. If the first gives somewhat better results as regards cure, and is, therefore, safer, it is not so good as partial resection with regard to the possibility of recurrence.

If we now compare some of the figures in the second period—that is to say, where earlier diagnosis and improved technique are playing their

important parts—we find that after thyrotomy there are fewer deaths from the operation than after complete excision—*i. e.*, 6.6 per cent. as compared with 14.2 per cent. We find, further, that many more cases are cured after thyrotomy—11 per cent.; complete excision, 1.5 per cent. We have already seen that Semon's and Butlin's statistics give even better results for thyrotomy, both as regards immediate results and cure, Butlin having had no deaths since 1896. With regard to recurrences, it is true that the percentage after complete excision is lower than that after thyrotomy (11.2 per cent. as compared with 16.9 per cent.); but there are no facts furnished in the tables to show us whether the cases treated by thyrotomy were cases of intrinsic cancer or not.

CONGENITAL LARYNGEAL STRIDOR, OR INFANTILE RESPIRATORY SPASM.

Last year¹ I described at some length the clinical features of a typical case of this affection, and commented upon the various theories that had been put forward with regard to its etiology. At the same time some doubt was expressed as to whether a true explanation of the phenomena had been arrived at. My present intention is merely to lay before the reader the salient points of an investigation carried out by Dr. John Thomson and myself with the object of ascertaining whether any further light could be thrown upon this interesting affection. Its main features will perhaps be fittingly reintroduced to the reader by reference to a case recently reported by Variot and Hadour,² of Paris. The child, well nourished and healthy, was examined one month after birth, and was found to be breathing with the characteristic inspiratory stridor, of a croaking nature, rising to a more high-pitched crow; it was almost continuous by night and by day, and was exaggerated when the infant cried or when otherwise roused; respiration was otherwise normal. There was indrawing of the suprasternal notch and in the lower part of the thorax. There was no cyanosis, no discomfort, and no dyspnoea, and the infant was able to take its nourishment without any inconvenience. The stridor was said to have commenced immediately after birth. There was no coryza, no enlarged tonsils, no adenoids, and no nasal obstruction. The noise was in no way modified by the position in which the child was held. Laryngoscopical examination showed the vestibule of the larynx to be slightly reddened; the interarytenoid region was normal, and the aryepiglottic folds in their posterior two-thirds were not in

¹ PROGRESSIVE MEDICINE, Vol. I., March, 1900.

² La Tribune Médicale, Paris, October 24, 1900.

apposition. The vocal cords appeared to move, and the glottic chink was normal. The epiglottis was characteristically rolled backward, so that its lateral margins touched each other and gave the appearance of a spout; on this account the aryepiglottic folds touched each other in their anterior third. The patient was frequently seen during the next few months, and toward the fifth month the stridor began to diminish in intensity, and at the eighth month had disappeared. These symptoms have been attributed to such causes as posticus paralysis (Robertson), or to adductor spasm due to adenoids, or to some other source of irritation (E. Smith, Löri). Some, again, have blamed an enlarged thymus gland (Avellis), and others a congenital malformation of the upper aperture of the larynx (Lees, Sutherland and Lark, Variot, Refslung). Attention has also been drawn to the soft, collapsible character of the laryngeal structures in the infant (Goodhart, etc.), while Thomson has defined the primary cause of the obstruction as probably due to an ill-coördinated, spasmodic action of the respiratory muscles—a choreiform respiratory spasm analogous to stammering as distinguished from a laryngeal spasm.

Our most important conclusions may be stated as follows :

1. That the primary element in the causation of this condition is a disturbance of the coördination of the respiratory movements, probably due to some developmental backwardness of the cortical structures which control them.

2. That the change of form found is merely an exaggeration of the normal infantile type, and is mainly, if not entirely, the result of a constantly recurring sucking in of the upper aperture of the soft larynx, which is induced by the ill-coördinated and spasmodic nature of the breathing; that it is, in fact, an acquired deformity strictly analogous to pigeon-breast.

3. That there is no proof that any congenital malformation of the upper laryngeal aperture exists in these cases.

4. That the supposition of a congenital deformity is not essential to account for the symptoms, inasmuch as normal babies crow in a very similar manner when they are coming out of chloroform.

5. That the sounds are laryngeal—*i. e.*, not produced in the pharynx or trachea.

6. That the neurosis causing the symptoms has not in our experience seemed to depend on the presence of adenoid growths or other obvious causes of reflex irritation.

That they are not produced in the pharynx is proved by the high-pitched, phonic character of the crow, and also by the fact that the stridor persists not only when the nostrils are closed, but equally when the mouth is occluded by the nipple, and also when the tongue is de-

pressed by a spatula and during yawning. That they are not produced in the trachea by compression exerted by a large thymus or enlarged lymphatic glands we conclude on two grounds: First, because in some of the cases of congenital stridor recorded which were examined post-mortem there was no enlargement of the thymus or lymphatic glands present; and, second, because in two cases which we have seen in which compression of the trachea by enlarged bronchial glands was found after death the symptoms were of a very different type. In these cases the stridor was mainly expiratory, the larynx did not move up and down with respiration as it does in cases of intralaryngeal obstruction, and there was much greater respiratory distress. The stridor is probably produced partly in the larynx proper and partly at the abnormally approximated aryepiglottic folds.

LARYNGEAL AFFECTIONS IN TYPHOID FEVER.

My attention has been recently drawn to the gravity of the lesion that may attack the larynx during the course of typhoid fever by observing the post-typhoidal laryngeal condition in a young man who had suffered from that fever. The almost complete loss of phonation and the inability to breathe without a tracheotomy tube in an otherwise healthy young man brought the subject somewhat forcibly before one's mind. In this case thyrotomy and the removal of the swollen and infiltrated tissues within the larynx, followed by the introduction of bougies, failed to remedy the condition, and the patient was doomed to go through life wearing a tracheotomy tube. The after-effects of such a lesion may, therefore, be very serious should the patient survive the immediate risks attending this complication of the disease. It has also appeared to me that too little attention is paid to this subject in the text-books on diseases of the larynx, and that the frequency and serious nature of the after-effects call for more space than is usually allotted to it. It is true that monographs and papers dealing with these laryngeal affections from time to time appear, but these are not always accessible to the general reader. We are much indebted to the work of Keen, of Philadelphia, for our knowledge of the laryngeal complications of typhoid fever, his earlier writings on this subject having been again added to and published as recently as 1898. According to that writer, the conditions met with may be grouped under three pathological varieties—œdematous laryngitis, ulcerative laryngitis, and laryngeal perichondritis. Two or more of these conditions can, of course, occur in combination. As a result of a suppurative perichondritis there may follow necrosis and exfoliation of cartilage, thickening, ankylosis, and deformity

of the larynx, with the subsequent impairment or loss of function of the organ. Lockhard¹ brings together the statistics of a number of observers relative to the frequency with which such laryngeal lesions occur during the course of typhoid fever. Some discrepancy is found in the percentages obtained, due possibly to the varying virulence of different epidemics. Thus Schroetter found ulceration in 3 per cent. of all typhoid cases, Heimer in 1.5 per cent., Griesses in 14.7 per cent., Holscher in 5.3 per cent., and Landgraf in 29.2 per cent. Severe laryngeal complications and a high death-rate apparently go together; but of 211 autopsies upon typhoid patients made by Campe in the Berlin Pathological Institute the larynx was involved in 67 cases, or in over 31 per cent. Dopfers, in Munich, found ulceration in 72 cases out of 732, while Kanthack and Drysdale noted laryngeal complications 14 times in 64 post-mortems. Landgraf, as a result of a summary of all known statistics, considers that the larynx is involved in at least 11 per cent. of all fatal cases. It is suggested, however, that since the introduction of the cold-water treatment these percentages have been greatly reduced.

The case reported by Lockhard is an interesting one, as it presents a clinical course very similar to that which is met with in these affections. The patient, a healthy adult, was attacked with typhoid fever of a serious type. On the eighth day of his illness he complained of a sore-throat, but no examination was made at that time. It was not, however, until the sixth week of the fever that throat symptoms of any consequence developed. There was a return of the pain and some dyspnoea, and on examination an abscess was found in the left arytenoid region. As suffocation threatened, tracheotomy was performed, and then the abscess was evacuated by an endolaryngeal incision; after final recovery had taken place it was found that the left vocal cord was fixed in adduction. The right vocal cord was abducted and perfectly rigid. Dilatation was carried out daily for a considerable time, but though the cords were readily separated by the instruments at the time of introduction, they immediately fell back into their old positions on withdrawal. The tracheal tube remained a necessity, Schroetter's and O'Dwyer's tubes proving of no benefit. An attempt was then made to establish breathing *per vias naturales* by removing the cords by means of Heryng's curettes; a sufficiently large opening was obtained and the tracheal wound was closed. The voice, except for a faint whisper, was destroyed.

Marsden² records four cases, the leading features of which may be

¹ New York Medical Journal, June 30, 1900.

² Manchester Med. Chron., January, 1900.

briefly reported here. A girl, aged thirteen years, experienced a rise of temperature, with cough, laryngeal stridor, dyspnoea, and cyanosis in the eighth week of her illness. Laryngoscopical examination revealed a round, inflammatory swelling on the right side, concealing the right vocal cord, and of a yellowish color at its middle point. Tracheotomy was performed. At a later date dilatation was undertaken and the tracheotomy tube removed for a time. Owing, however, to complete fixation of the right vocal cord, deficient movement in the left, and considerable thickening, which resisted dilatation, the tracheotomy tube was left in permanently. In the second case, which was that of a young man, aged nineteen years, complete aphonia supervened in the seventh week of the disease. In the ninth week inspiratory stridor and cyanosis demanded tracheotomy. Two weeks after this operation examination of the larynx revealed swelling of the arytenoids, aryepiglottic folds, and false cords. At the end of the fifteenth week there was almost complete absence of swelling, but the right vocal cord was fixed.

In Case III., a man, aged thirty-five years, hoarseness showed itself at the end of the fourth week of the illness, and in the sixth week there was inflammatory oedema around the arytenoid cartilages, which spread to the aryepiglottic folds. At the end of the eighth week the parts were again almost normal. Case IV., a young man, aged twenty-seven years, was of special interest from the fact that diphtheria developed in the course of the disease. In the sixth week of the typhoid he complained of difficulty in swallowing, followed by some huskiness of voice and slight inspiratory stridor. The epiglottis was greatly swollen and obscured the parts beneath. The stridor became so marked that tracheotomy was necessary. Diphtheria was recognized, and in all probability the laryngeal lesion was a diphtheritic and not a typhoid manifestation.

One point which is brought out by a study of these cases is that the laryngeal complications occur late in typhoid fever; thus we find that the larynx became involved in the sixth, seventh, and eighth weeks of the disease. Further, dyspnoea is a marked and usually a sudden symptom, and owing to the fact that the symptoms and signs of a commencing lesion are comparatively trivial, attention is not drawn to the larynx, and dyspnoea may unexpectedly supervene. A fatal result is thus not so infrequent.

Where recovery takes place in those cases where inflammation of the larynx and perichondritis have occurred the question of the after-treatment and of the final result is an all-important one. Treatment by dilatation is wearisome alike to patient and surgeon, and often most unsatisfactory. In Marsden's first case the attempt to dilate with

bougies and special tubes was continued during eighteen months, but even then a permanent removal of the tracheotomy tube was not justified. Closure of the tube with the finger permitted of conversation in a loud whisper, but otherwise the larynx was functionless. In the second case the result was similar.

OTOLOGY.

BY ROBERT L. RANDOLPH, M.D.

THE EXTERNAL EAR.

Lupus of the Ear. Lupus of the ear is a very rare affection. Buck¹ says he has never seen a case. Strawbridge,² of Philadelphia, reports one case of the disease, and Neumann³ makes the statement that the auricle is the favorite seat of lupus. I find, however, in spite of statements to the contrary, that the general consensus of opinion among otologists is that this affection is a rare one. Leloir's statistics cover two hundred and eighty-six cases of lupus of the face, and in fourteen cases the ear was attacked.

The ear is exceptionally attacked primarily, but is usually secondarily involved from the face. Dr. Liaras, of Bordeaux,⁴ has recently made an interesting communication upon this subject. He follows the plan laid down by the majority of observers, and speaks of two kinds of lupus, namely, the tuberculous lupus and the erythematous lupus. We know, though, that they have one chief characteristic in common, namely, their destructive tendency. The main point of difference lies in the fact that in the first form we usually have ulceration, while in the latter variety ulceration is absent. The author then goes on to discuss tuberculous lupus and its various subdivisions, and he tells us some of the points in which it differs from erythematous lupus. As a general thing the latter variety differs from the tuberculous form in that it shows itself as an erythematous redness. Erythematous lupus is observed only in the adult, while the tuberculous form may be seen almost from infancy. The erythematous form is much more superficial in its location, and may be apparently nothing more than a simple thickening of the auricle. Its progress is regular and more rapid than that of the other variety of the disease, and finally its consistency is greater than that of the tuberculous form.

It is evident that Liaras regards true tuberculous lupus of the auricle as a very rare occurrence, having a very obscure origin and usually being

¹ A Manual of Diseases of the Ear, p. 69.

² Transactions of the American Otological Society, 1874.

³ Monatsschrift für Ohrenheilkunde, May 5, 1869.

⁴ Rev. heb. de laryng., d'otol., etc., 1900, Nos. 5, 6, 7.

secondary to lupus of the face. The primary form may be seen secondary to piercing the ear for ear-rings. It usually has a myxomatous appearance, with some tumefaction, giving to the finger the sensation of fluctuation. It invades both sides of the auricle and is extremely tenacious, and when it is cured it is not without leaving behind permanent destruction of tissue.

The author speaks briefly of lupus of the external auditory canal. This part of the ear is even more rarely affected than the auricle, and when seen it is usually the result of the disease having extended by contiguity of tissue; in other words, from the auricle. He reports a case in which the affection possibly had its origin in the middle ear, but it is by no means certain that this was the true interpretation of the case. The prognosis is less favorable than lupus of the auricle, because in such a situation the trouble is comparatively inaccessible, and then it involves more directly the channels by which sound reaches the middle ear, and finally because of its tendency to attack the middle ear.

When we come to lupus of the middle ear we find that it is rarer than either of the forms of lupus just described. As regards the various treatises on otology, while they speak of lupus of the auricle, as a rule, they are silent on the subject of lupus of the middle ear. So far as I know we have only three or four recorded observations. These are as follows: One by Gradenigo, one by Ouspenski, and the communication by Brieger, made in 1891, in which he analyzes thirty-one cases of lupus of the nose and makes the statement that among them he found only three times complete integrity of the ear. I find also the reports of two cases from the clinic of M. Moure, cases, however, which I think cannot be regarded as well-established examples of lupus of the middle ear. If we study this class of cases we will not notice that it has any peculiar or characteristic train of symptoms. Take, for instance, the cases which were seen in Moure's clinic. In one the commencement of the disease was very insidious, which fact would correspond with our notions of how lupus should commence. On the other hand, in the second and third cases the behavior of the disease was entirely different, being more or less fulminating in character and accompanied with profuse otorrhœa. One case had all the characteristics of a plastic otitis, while the other had those of a suppurative otitis. Usually the malleus is immobilized in fibrous tissue. Sometimes the membrane is perforated, the perforation having ragged edges, and there will frequently be noticed here and there on the membrane brownish crusts analogous to those met with in lupus in other situations. Sometimes the process comes out through the perforation, reaches the external canal, and attacks the latter; and when we meet with this condition of affairs there is very strong reason for believing that we are dealing with lupus.

There is a very conspicuous difference between the tympanic membrane which is the seat of lupus and that of an ordinary suppurative inflammation. In the latter condition the perforation has clean-cut edges, showing a tendency to heal over, while in lupus the edges of the perforation are jagged, ugly looking, and show a decided tendency to ulcerate. In lupus of the middle ear, even when recovery has taken place, the tympanic membrane will be found to have lost entirely its original color, its perforation remaining irregular, and it is always covered with brownish crusts. This, as we know, is entirely different from what we see in an ordinary suppurative inflammation of the middle ear. According to Liaras, the course of lupus of the middle ear is slow, and it is not apt to result in complete deafness.

In lupus of the auricle, Liaras recommends scarifications and the galvano-cautery as giving the best results. He refers to the work of Finsen, who has utilized the so-called light treatment for such cases. Finsen reports sixty cases of lupus of from ten to fifteen years' standing which were cured within three years. The same treatment is applicable to lupus of the external auditory canal. When the middle ear is the seat of the disease it is well to make a paracentesis of the tympanic membrane, so as to empty the middle ear of the exudate which is usually present. Either the Valsalva or the Politzer method should then be employed. It is well to touch the walls of the perforation with either chromic acid or pure lactic acid. Sometimes gentle curetting will be found beneficial. My excuse for presenting such a lengthy review of the subject of lupus of the ear is because it has found little or no notice in literature up to the present time.

Epileptiform Attacks Due to a Plug of Cerumen. De Hilden, Kupper, and others have reported cases where the presence of a foreign substance in the external auditory canal has brought on epileptiform attacks. Recently Dreyfus¹ has mentioned a case of this character. The patient was a young fellow, aged twenty years, with no history of previous trouble. He had fallen on the ground several times and had remained unconscious each time. The attacks were further characterized by convulsive movements without any biting of the tongue or relaxation of the sphincter. The patient's intelligence was above the average, but since the beginning of these attacks his intellectual faculties had become sluggish, and he complained of visual disturbances and headache. In his last attack he fell on his right side, and Dreyfus examined him with a view of ascertaining whether there was any ear trouble on that side. There was some deafness, and he discovered a plug of cerumen, which, when removed, proved to be one and one-half

¹ Lyon Méd., 1900, No. 23.

centimetres in length. Since the removal of the cerumen the attacks have never returned. Such cases are very instructive not only as showing the possible effect of peripheral irritations, but because they teach us that we should examine the ears of those who are the subjects of similar nervous phenomena.

Furunculosis of the External Auditory Canal and Abscess of the Anterior Part of the Mastoid. THE DIFFERENTIAL DIAGNOSIS. These points have been brought out by Bar.¹ He based his conclusions for the most part upon the observations of four cases where it was difficult to decide which of these two conditions was present. Some of the points which he brings out are valuable. One of the differential points is that the microbic nature of the pus is different in the two cases. I scarcely think that this can be regarded as a symptom of great value, for the rule is that one or the other of the pyogenic germs is present in both affections, and the staphylococcus aureus is common to both furunculosis and abscess of the mastoid. The following point, however, is a good one, namely, that early swelling and inflammation of the glands in front of the auricle is the rule in furunculosis of the canal, while such a symptom is late and exceptional in mastoid abscess. Again, he has observed that in furunculosis the edema effaces the furrow just behind the ear, while in mastoiditis this furrow remains intact. Another point upon which he lays stress is this, namely, that owing to a different nerve supply the pain in furunculosis is spontaneous and very violent, while in mastoiditis the pain is very dull, and in the latter condition too often we have an exaggeration of the sensation of taste. These are interesting and in the main important points of difference, for I have more than once seen cases of furunculosis where the symptoms pointed very strongly to mastoid involvement.

Detachment of the Auricle. An interesting case of this character is reported by Rauche.² The case is worthy of note because the auricle was entirely severed from the head. The man was fencing, when a cut deprived him of his auricle, which flew off and fell under a table several feet away. There were at least five minutes lost between the accident and the time when the auricle was sewed back into place. Four deep sutures were made through the cartilage, and a number of finer and more superficial ones were also inserted. Warm compresses were applied for half an hour, and then a bandage was adjusted. The next day the auricle looked necrotic. Warm alum compresses were applied, and leeches were used to bring the blood to the surface from the deeper parts where there had been more or less stagnation. It is sufficient to say that in six weeks the auricle had completely reunited.

¹ Annales des mal. de l'oreille, du larynx, etc., T. xxv., No. 4.

² Rev. heb. de laryngol., d'otologie, etc., March 24, 1900.

A Dehiscence in the Lower Wall of the Bony Canal. Gruber¹ mentions a very singular case where there was a splitting or bursting open in the lower wall of the external auditory canal in its bony part just below the cartilaginous ring of the tympanum. In this space or chamber could be plainly seen the bulb of the jugular vein. The entire part presented a dark, livid color, with moderately convex surface, and showed on the most convex point a slight light reflex. This livid area seemed elastic to the touch, and when pressure was made upon the jugular vein of the same side it was observed that this area became larger; in other words, it swelled up. He offers various theoretical explanations for the existence of the anomaly.

Sarcoma of the External Auditory Canal. Gorham Bacon² has reported a case of sarcoma of the external auditory canal occurring in a woman, aged fifty years. It was removed and perfect healing followed. These tumors are not clinically sarcomata. It is well known that the aural polyp which we so often remove presents the histological characteristics of sarcoma, but such growths are practically non-malignant.

Hæmatoma of the Auricle. Boulay³ has made the following suggestions as to the treatment of this affection: Massage at regular intervals, and during the intervals keep a compress bandage applied. If the massage fails, open the swelling with an aspiratory needle and apply a soft compress. If after puncturing the tumor repeatedly there is always a return, an injection of iodine should be tried, and in case this latter prove unsuccessful he advises a large incision to be made in the tumor, its contents emptied, its walls curetted, and the lips of the wound brought together with sutures. If the hæmatoma suppurates it must, of course, be incised at once, its walls curetted, and the cavity filled up with iodoform-gauze.

THE MIDDLE EAR.

Acute Suppurative Inflammation of the Middle Ear. The subject of acute suppurative inflammation of the middle ear is one which is full of practical importance to the general practitioner, and, while in the main an old story, its records will be found every year to contain something valuable as well as new. No doubt it has often perplexed the general practitioner when confronted with a case of this kind to decide between an affection of the middle ear and a boil of the external auditory canal. We all know how similar the symptoms are, and when

¹ *Monatsschrift für Ohrenheilkunde*, etc., 1900, No. 1.

² *Archives of Otolaryngology*, February, 1900.

³ *Concours med.*, January, 1900.

the inflammation is of a violent character and the patient is seen at an advanced stage of the disease, and is not very clear as to the onset and sequence of the subjective symptoms, it is often impossible to make a positive diagnosis. The absence of deafness, of tinnitus, or the development of these symptoms after the pain has lasted for two or three days, points, as a rule, to an inflammation outside of the middle ear, but, as I have said, in many cases the patient is utterly unable to give a true account of the early stages of the trouble. In such a dilemma Richter¹ reminds us that if the hearing is not markedly affected we can find out which of the two affections we are dealing with by making light traction on the auricle, and if this manœuvre elicits pain we are always dealing with a furuncle. We should remember, however, that in cases of furunculosis associated with deafness it would often be difficult to decide whether the deafness be due to closure of the external auditory canal by the boil or to implication on the part of the middle ear, particularly when the patient is vague in his account of the onset of the trouble. The symptom, then, upon which Richter lays so much stress is only valuable when very little if any deafness be present.

CLINICAL FEATURES. The clinical characteristics of suppurative inflammation of the middle ear are as follows: We have local and general symptoms somewhat more intense than those seen in the non-suppurative form. The tympanic membrane becomes infiltrated and puffed out, grayish looking, softened, and perforated. The site of the perforation is usually in the lower half of the membrane. If the lesions are slight, the membrane heals over gradually and hearing may be unimpaired. The prognosis for hearing is always more or less serious. It is graver in the case of infants, for cerebral complications are more to be feared. The treatment should be directed to mitigating the pain and inflammation. Malherbe² believes in an early incision of the membrane as a measure which may ward off mastoid involvement. I may say here that it is not only senseless but dangerous to consider (as many of the laity do and some physicians, too) that an otorrhœa is simply a freeing of the ear of morbid humors or products, and that if it should be stopped these so-called humors or products will be retained and trouble follow. Otorrhœa is a condition which presents great danger not only for the ear but for life as well. It can cause deafness at any time of life. By extending to the brain and its coverings it can cause death, and by being neglected in the early years of childhood it can lead to deaf-mutism.

ANATOMICAL CHANGES. In connection with the subject of suppurative inflammation of the middle ear it may be interesting to refer to

¹ Münch. med. Wochenschr., March 20, 1900, S. 404.

² Le Bull. méd., January, 1900.

some investigations which have been recently made by Weiss. Weiss made his report to the Austrian Otological Society in February last.¹ He examined the ears of twenty-eight infants who were for the most part subjects of malnutrition, disease of the intestinal tract, bronchopneumonia, and the usual affections of infants. The method followed by Weiss consisted in the removal of the ears from the skull, in the bacteriological examination of the contents of the tympanic cavity, and, finally, in the anatomical examination of the middle ear. The latter examinations frequently showed the presence of a serous exudate, while the mucous membrane was shining and moist. Histologically, one noticed an infiltration with mononuclear and polynuclear small cells. This infiltration was limited to the superficial layers of the mucosa, the deeper layers presenting nothing abnormal, but both layers presented the characteristics of embryonic mucous membrane. In another series of cases the contents of the tympanic cavity were viscid and cloudy, and the mucosa resembled granulation tissue. The surface of the mucosa was uneven and was the seat of numerous little excrescences, polypoid in character, and in the deeper layers of which there was noted the same character of small cell infiltration as in the first series of cases. The bacteriological examination showed the presence of these organisms arranged in the order of their frequency, as follows: diplococcus of pneumonia, streptococcus pyogenes, and staphylococcus pyogenes albus and aureus. In some cases the bacillus pyocyaneus and the influenza bacillus were found. The bacteria were usually found in the exudate, sometimes in the superficial layers of the mucosa, and three times within the bloodvessels.

Perforation of the tympanic membrane was noted in 1.2 per cent. of the cases. The author concludes from his observations that the otitis media of the new-born is a benign affection in which the changes are located in the superficial layers of the mucosa. Infection sometimes travels by way of the Eustachian tube, rarely through the circulation. He concludes, finally, that the mucous membrane of the middle ear of infants possesses much feebler powers of resistance than that of the adult. And while I am speaking on the subject of bacteriological examinations in this class of cases I should refer to some work of this kind by Jürgens.² It may be remembered that I called attention in my report last year to the work of Leutert, of Königsberg, who generally found either the pneumococcus of Fränkel or the staphylococcus pyogenes. Jürgens observed that when the streptococcus pyogenes longior was present in pure culture, fever with manifestations of septi-

¹ Rev. heb. de laryngologie, d'otologie, etc., No. 23, p. 677.

² Monatsschrift für Ohrenheilkunde, February, 1900, No. 2.

cemia was also present. When there was a mixed infection of streptococcus brevis and longior with staphylococci the course of the disease was apt to be long, with only a few violent symptoms and with a rather low temperature-curve. When the otitis was caused by the streptococcus brevis (Behring) he noticed that violent attacks would come on periodically, and in the intermissions the patient was quite comfortable. He found that the streptococcus pyogenes brevis, while it caused marked local destruction, gave rise to insignificant general symptoms. The presence of staphylococci with streptococci seemed to have the effect of weakening the character of the infection so far as the latter organisms were concerned, while a pure staphylococcus infection generally gave rise to very intense symptoms. Mention here should be made of a contribution of Nadoleczny.¹ The author, just as did Leutert and others, found most frequently the diplococcus lanceolatus of Fränkel and not a streptococcus. Apart from these organisms one often finds staphylococci, rarely the saprophytes. The passing of the suppuration into the chronic condition is very often independent of the nature of the organisms, and is to be attributed to either local or constitutional causes or to a chronic affection of the nasopharynx. Grave cases are due to streptococcus pyogenes, which can as well provoke benign inflammations, but these latter are due most often to the pneumococcus. It is probable that the exudate which we find in the tympanic cavity possesses in a certain measure a bactericidal power. This hypothesis permits the explanation of spontaneous cures without perforation of the tympanic membrane. Speaking of the pneumococcus, Giles² has recently reported an interesting case where the acute otitis media was found to be due to the pneumococcus. The ear trouble got well, but secondary infection of the lungs followed and consequent pneumonia.

Local Blood-letting and Cold Applications in the Treatment of Acute Inflammations of the Middle Ear. We are all aware of the fact that leeches applied over the region of the tragus or in the angle just behind the auricle often afford the greatest relief from pain in this class of cases, and in addition this measure often checks inflammation. It cannot be said, however, that local blood-letting has found much favor among otologists in treating acute inflammations of the middle ear, especially in the case of infants. Under these circumstances we are advised to abstain wholly from the use of leeches. The beneficial effect of local blood-letting is best seen after a purulent discharge has set in, and then we see it often do good where everything else has failed. Miot³ within the past few months has reported several cases in which

¹ Archiv für Ohrenheilkunde, Bd. xlviii., 2-3, 1900.

² Quarterly Medical Journal, 1900, vol. viii., Part II.

³ Rev. heb. de laryngol., d'otol., etc., February 24, 1900.

he obtained excellent results in infants by the extraction of a small quantity of blood. Two of the infants had contracted acute otitis media during an attack of measles, and another had contracted the same trouble as a result of scarlet fever. Miot employs preferably the Heurteloup leech, though at times he uses the ordinary leech. He applies the leeches at the inner retromaxillary angle over the tragus whenever in the course of an acute inflammation of the middle ear the pain is excessive and is exaggerated by pressure exercised upon the lower part of the mastoid. For an infant of very tender age he uses only one leech, and allows the wound to bleed for five minutes. For a child three years old and over one may use two leeches. As a general rule, the number of leeches is proportional to the age of the child and to its strength. He suggests precautions which seem to me wise in the employment of leeches, and which he seems to think have a great deal to do with his success with this therapeutic measure. It is of the utmost importance to prepare the skin by a thorough cleansing before applying the leech. This is done by rubbing it well with cotton soaked in alcohol and following this with a scrubbing with boiled water. The leeches should be taken from a clean glass receptacle, and they are put back into the receptacle as soon as they are full of blood. The wound may be allowed to bleed from five to twenty minutes, when it should be covered up with a piece of linen soaked in boiled water. It is well to apply a piece of aseptic gauze to the bite, and the whole thing may be kept in place by a bandage. We should remember, however, that the time to employ this method of treatment is in the commencement of the trouble, when the disease is evidently on the rise, so to speak. Rarely is it necessary to make more than one application of the leeches, though I see no reason why the treatment should not be repeated if necessary at short intervals, say of a day or two. Miot speaks in the same place of the value of cold applications in acute otitis media. The application should be made either in the form of cloths soaked in ice-water and applied about the ear or in the form of the well-known Leiter coil. I cannot agree with the author, however, in this suggestion, for unless there be some distinct mastoid sensitiveness I have always thought that heat either in the dry or the moist form met the requirements of the case far more satisfactorily. Flannel pillows or bags containing hot bran, hops, or hot sand often afford the greatest comfort, and at other times I have followed the suggestion of Buck and poured water of a temperature of 100° F. into the external auditory canal. A medicine-dropper will be found useful for the purpose of instilling the drops of water into the ear. A vessel containing hot water is kept near by, and from this the canal is filled. A cloth is then soaked in the hot water, wrung out, and laid over the auricle. This helps to

retain the heat in the external auditory canal. After a little while the water is allowed to run out, and a fresh supply is introduced in the same manner. This measure has rarely failed to prove useful in the painful stage, and it is a routine step with me in such cases. Miot, however, in comparing the results of the two methods—*i. e.*, the cold applications and blood-letting—gives the preference to the latter. He makes no mention of heat as a therapeutic measure.

It cannot be said, however, that Miot is enthusiastic over the value of cold applications in otitis media. He acknowledges that they sometimes aggravate the condition. He used leeches two hundred and forty-four times, and in fourteen cases only did he fail to get a good result, while in seventy instances in which he used cold applications he had four failures. In two of the cases the effect of the cold was to retard the inflammation, while the leeching had no effect. Miot's contribution, then, bears rather upon the relative value of the two methods, with the preference in favor of local blood-letting.

Treatment in Children. In the treatment of otitis media acuta in children we must follow in a general way the rules which govern our course when we are dealing with adults. The local use of heat is just as beneficial in this class of cases as in adults, though it is of course somewhat more troublesome in the application. I do not believe it wise, as I have before remarked, to use cold applications. Barth¹ has recommended the local use of iodine, and I am disposed to regard the suggestion favorably. The same author reminds us of the great tendency in these cases of the perforation to close rapidly, and he suggests a course which he is in the habit of following and which seems to me is open to criticism. Instead of enlarging the opening with a knife he makes use of a caustic, especially in small children. He first cocainizes the drum-membrane and then dries it with a cotton probe. After this he places a crystal of chromic acid directly into the opening. I have always thought that chromic acid was too irritating, too far-reaching in its action to use in the middle ear. This has been my experience in using it in adults. I have known of more than one case in the practice of others where the application of chromic acid has been followed by violent pains and even serious symptoms. Chromic acid destroys not only what it is meant to destroy, but it spreads to healthy parts and there acts as an irritant. There seems to be no way of limiting the extent of its activity. The author says he has never seen a case where the use of chromic acid did permanent harm. I have substituted nitrate of silver for chromic acid in all operations upon the ear where I desire to get a caustic effect.

Otitis Media and Earache in Lobar Pneumonia of Children. It will be remembered, perhaps, that nearly two years ago Meltzer, of New York,¹ made a communication upon the occurrence of acute inflammation of the middle ear in children who were affected with lobar pneumonia. He brought out the following points: 1. Otitis media is an extremely frequent disease in children, especially in poorly nourished ones. 2. Bronchopneumonia is very frequently complicated with otitis media. 3. In lobar pneumonia of children purulent otitis media is at least very rare, possibly because the pneumonia by its hyperleucocytosis acts as a derivative upon the otitis. 4. Many cases of lobar pneumonia begin with an earache which disappears gradually.

Following close upon this communication I find one by Dr. E. H. Pomeroy,² of Calumet, Mich. Three years ago Ponfick,³ of Berlin, published a monograph upon the same subject, and it may be interesting to recall how Ponfick's attention was drawn to the question. His own children had been ill with gastro-enteritis, and in spite of the most assiduous attention grew worse, when suddenly a change for the better appeared, and along with this change the ears began to discharge. The improvement in the intestinal trouble continued, when, on the cessation of the discharge, there was a fresh outbreak of the gastro-intestinal trouble. This was attributed to faulty food, and the discharge was well-nigh forgotten, until it recurred, and with it a sudden and pronounced amelioration of the intestinal symptoms. This happened with several of his children. It impressed Ponfick so much that he made an examination of the middle ear in the first subsequent one hundred autopsies of children under three years of age. He has made a tabulated statement of these cases, dividing them into those which suffered from an infectious and those which suffered from a non-infectious process. I need not give an analysis of this table, but it suffices to say that the results of his autopsies showed the great frequency of otitis media in children affected with the grave diseases of infancy, and these results have only been strengthened by the observations of Weiss, to whose work I have already alluded.

To return to Pomeroy's communication. It is easy for us to understand how the tympanic cavity can be infected through the Eustachian tube and that once infected inflammation can be excited which will close the tube. The tympanic cavity then becomes an incubator for bacterial growth and a generator for the production of bacterial toxins. These toxins are absorbed into the general system, and this toxæmia will, of course, influence any concurrent or accidental ailment in any other

¹ Philadelphia Medical Journal, August 5, 1899.

² Boston Medical and Surgical Journal, January 18, 1900.

³ Berliner klinische Wochenschrift, 1897, No. 38.

portion of the infant's body. One can readily understand the relief which followed the recurrence of the discharge in Ponfick's children. Just as soon as the drum-membrane ruptured the cavity disgorged itself and no longer acted as a source of infection. When the discharge stopped the gastro-intestinal trouble began again, an evidence of retention of pus within the tympanic cavity and the consequent production of toxins. Such is the explanation which Pomeroy, Ponfick, and others have given to these cases, and the former has reported five cases in which complete relief from remote disorders was obtained by simply performing paracentesis of the tympanic membrane. The first was a child, aged eight months, who, in spite of the usual treatment for such trouble, died of intestinal disease on the third day. At the autopsy the left tympanum was found tense, and on puncturing it a clear fluid was liberated. The right tympanum was also tense and bulging, and on puncturing it thick pus poured out. The next case was a child who had been crying continuously for fifteen days and was very much constipated. Five physicians had examined the ear and found nothing abnormal. Paracentesis, however, of the tympanic membrane was performed and three or four drops of pus liberated, and the child from that time began to recover. The third case was a child, aged seven weeks, who had been vomiting for three days and had a high temperature. There was no tenderness on pressing the palm of the hand against the external ear. Paracentesis was performed and scarcely more than a drop of pus liberated from each tympanum. In twenty-four hours the child was apparently absolutely well, nursing and sleeping naturally and with a normal temperature. The next case was a child, aged eighteen months, who had been suffering from bronchopneumonia and diarrhœa for ten weeks. There were no ear symptoms, but puncture of both membranes was performed. Profuse discharge of pus followed from one ear and a very slight discharge from the other. There was immediate relief from restlessness and pain, and in twenty-four hours complete convalescence was established. The last case was a baby, aged five weeks, which had been suffering from watery diarrhœa for three days. Puncture of the right tympanum liberated two or three drops of pus, and immediate amelioration of the symptoms followed.

I have given a good deal of space to these observations, for they are, to say the least, startling. The findings at the autopsies reported by Ponfick and Wiess justify the belief that involvement of the middle ear in the serious diseases of infancy is almost the rule. This seems to be the fact if we are to accept the observations of Ponfick and Weiss as trustworthy, and we have no reason to think the contrary. I have been unable to find any statement in the literature to the effect that paracentesis of the drum-membrane has been tried by others in this class of

cases. We are all aware of the frequency with which discharging ears are seen in infants, and that, too, without other ear symptoms. Mr. Ballance,¹ by the way, is quoted as saying that the middle ear of every child under five years of age contains muco-pus. I might remark here that it is more than probable, as von Gaessler² has pointed out, scarlet fever must be put down as a disease in which (as is the case with measles and diphtheria) the middle ear is more or less always involved.

It is doubtful whether the subject has received proper attention, and if it be true that the condition of the middle ear exercises such an important influence upon the general condition of the child, especially of those affected with pulmonary and gastro-intestinal disorders, a great advance in the treatment of these disorders will have been made as the result of the observations of Ponfick, Meltzer, and Pomeroy.

I might say here that it should be borne in mind that normally there is a sort of œdema of the mucous membrane of the middle ear and even a little fluid in the middle-ear cavity in foetal life, and these conditions disappear soon after birth. Sometimes, however, these conditions persist and may not entirely disappear for months after birth. Viellard³ has found this condition in two cases where the infants were eight months old, and he shows that it is not due to inflammation but is really a persistence of the foetal state. These facts should be remembered in making autopsies of the middle ear in infants.

Intracranial Complications. We are all acquainted with the dire results which sometimes follow in the wake of a chronic suppurative inflammation of the middle ear. When suppuration has been going on in the middle ear for a long time and we have as a result cholesteatomata, caries of the walls of the middle ear and of the ossicles, concentric narrowing of the external auditory canal, filling up of the latter and of the drum cavity with polypoid growths—when these results happen we are not surprised if sometimes we are confronted with the symptoms of either pyæmia, meningitis, or brain abscess. But it is a rare and unexpected thing to most of us to meet with these dangerous complications as a result of an acute inflammation of the middle ear, and this is not only true of the middle-ear suppuration which one sees after such serious diseases as scarlet fever, typhus, and tuberculosis, but even after an ordinary catarrh of either the nose or the pharynx. Whether this suppuration has led to perforation and otorrhœa, or whether suppuration has taken place without perforation, it is all the same; we can see the patient in a short time in great peril. Three cases of this character

¹ *Lancet*, May 20, 1900, p. 1516.

² *Zeitschr. für Ohrenheilkunde*, Band xxxvii., S. 171.

³ *Rev. heb. de laryngol., d'otologie*, October 20, 1900.

have been lately reported by Prof. Bezold.¹ In the first case, four weeks after the commencement of an acute middle-ear trouble—suppuration in an ear which had always been a healthy one—there appeared unmistakable symptoms of sinus phlebitis and pyæmia. The second case was one which developed a Bezold abscess two weeks after the beginning of the middle-ear trouble. In the last case brain abscess was found at the operation, and is especially interesting from the fact that there was never any perforation of the tympanic membrane. These cases show what serious results may follow an apparently harmless middle-ear suppuration, and they should be a constant warning to us to be on our guard and to watch for such symptoms as a retarded pulse, neuritis optica, and vertigo. Scheibe² reports a case somewhat similar to the three just described. In his case there was a remarkable absence of characteristic symptoms. Aside from the two chills at the commencement of the trouble, headache, and a transient sensitiveness under the mastoid process, there was nothing to give rise to the suspicion that there was a grave complication present. I should have said that the patient had been suffering with influenza.

GRIP AS A FACTOR. In speaking of influenza in the case above I am reminded of the frequency nowadays with which we meet with mastoid complications. It is no uncommon thing for an acute inflammation of the middle ear in a case of grip to be associated with pronounced tenderness over the mastoid, and I think in nearly all of the cases of influenza otitis which have been under my care tenderness over the mastoid has been a symptom, though, of course, exceptionally reaching the point where operative measures were demanded. What I mean to say is that influenza otitis is more apt to be accompanied by mastoid sensitiveness than otitis from other infections. We are all agreed, I think, upon the point that the existence of influenza in our midst has materially increased the number of mastoid operations.

Súgar, of Budapest,³ has called attention to the following points as being rather characteristic of otitis media of influenza origin. The perforation is generally in the anterior lower quadrant, and in those cases where the perforation happens to be in the upper posterior quadrant it will be noticed that the suppuration is most obstinate and will often call for an artificial opening in the lower posterior quadrant. The pain in otitis media of influenza origin usually persists for days after the rupture of the drum-membrane, and we know that in otitis media from other causes the pain usually disappears with the rupture of the drum. The author speaks of the frequency of mastoid complications. We

¹ Münch. med. Wochenschr., 1900, No. 22.

² Ibid., No. 26.

³ Archiv für Ohrenheilkunde, Band xlix., Heft 1.

often find an abscess in the mastoid which apparently has no communication with either the tympanic cavity or the antrum, and rarely does such an abscess go on to resorption. The secretion of the tympanic cavity is often bloody in character. He wisely cautions against the too ready use of the catheter and inflation generally, and I am firmly convinced that in this kind of infection that not only can the progress of the infection toward the mastoid be hastened by this procedure, but that mastoid infection may be directly brought about by driving thus forcibly the bacteria out of the tympanic cavity. I do not remember to have seen a case where the latter occurred, but I have met with more than one case where there was decided pain in the mastoid region a few hours after the inflation, and I have abandoned this measure absolutely in treating the otitis media of grip.

ETIOLOGY OF INTRACRANIAL COMPLICATIONS. I forgot to mention that Bezold has sought for an explanation of the dangerous complications in anatomical conditions. It is a well-known fact how very different is the development of the pneumatic cells in different individuals. In some cases, for example, they practically perforate the entire temporal bone, while in others these cells may be almost absent except in the mastoid antrum, and Bezold has never operated upon a case of acute middle-ear suppuration without finding these cells involved, and exceptionally has he failed to find circumscribed cells filled with pus and granulation tissue. In cases of Bezold's mastoiditis he always finds a large cell of this character on the floor of the process and on either one side or the other of the incisura mastoidea, and in the opinion of Bezold this is the cause of the gravitation abscess seen in this type of mastoiditis.

Involvement of Facial Nerve. In an interesting article, Tomka,¹ of Budapest, has presented to us a study of the relations existing between the facial nerve and diseases of the ear. As a matter of fact, however, facial paralysis in acute suppurative inflammation of the middle ear is a very seldom occurrence, and when seen it is due either to a perineuritis or to the fact that the pus has found its way between the nerve fibres. The paralyses are either transient or they can last a long time, and when caries of the Fallopian canal exists we may get an incurable paralysis.

In this connection I should mention that Bar, of Nice, has pointed out that simple paracentesis of the drum-membrane and evacuation of the pus will often relieve the condition. In other cases, however, more radical measures will be necessary. Bar reports three cases of paralysis of the facial nerve in the course of an acute otitis media where

¹ Archiv für Ohrenheilkunde, 1900, Band xlix., Heft 1.

operative measures were resorted to and where in all three cases the paralysis disappeared. Similar cases are reported by Murray,¹ of Washington.

We hear a good deal nowadays of puncturing the drum-membrane almost as soon as we see these cases. Milligan,² among others, holds that suppurations of the middle ear are not infrequently to be traced to having ruptured the drum-membrane. The result is that we get infection of the tympanic cavity from the external auditory canal, and as a consequence a tedious suppuration. The membrane, then, according to this doctrine, should be seldom punctured, and Milligan advises instead local revulsives, warm alkaline applications, rest in bed, and an antiseptic tampon in the external auditory canal. I am disposed to agree with Milligan in this conservative treatment of these cases.

Treatment with Boiled and Distilled Water. We all know that many of these cases recover with simple cleansing of the canal with warm water and that a certain number recover without any treatment. It is not surprising, then, when we see reports of cases cured by irrigations with either distilled or boiled water. Such a suggestion is made by Kotchinev.³ He treated fifty cases in this manner and compared the results obtained with those after using boric acid and salt solutions, and he found that recovery followed in one-third the time when distilled water was employed. He has had pretty much the same success with boiled water.

Treatment of Granulation Tissue. When very exuberant granulation tissue is present Bonain⁴ advises the following treatment: He first cleanses the canal of pus and then anæsthetizes the bottom of the canal by instilling a few drops of mentho-phenol cocaine. (Mention of this local anæsthetic will be found in my last year's report.⁵) The granulations are then removed as far as possible with either the snare or the curette, after which the parts are again anæsthetized. Chloride of zinc 1 : 10 or 1 : 5 is then applied. After the application of the caustic the canal is cleansed with boiled water, and a light iodoform tent or wick is introduced into the canal and the meatus is closed with gauze. This dressing is removed every two or three days, but as to this point one should be guided by the quantity of the discharge. His results are as follows: Twenty-five cases were treated. Of this number thirteen cases are well. Five are still under treatment and nearly well. Four cases were lost sight of, and of the other three cases one was pronounced practically hopeless and in the other two the treatment failed. The

¹ Archives of Otolaryngology, February, 1900.

² Med. Chron., 1900, No. 4.

³ Vrach, 1900, No. 10.

⁴ Rev. heb. de laryng., d'otologie, etc., July 21, 1900.

⁵ PROGRESSIVE MEDICINE, March, 1900, p. 388.

length of the treatment in the cases which were cured averaged twenty days. It seems to me that the method ought to be valuable, and I feel little or no hesitation in recommending it. I would utter a word of caution, however, about employing too violent cauterization.

Treatment of Chronic Suppuration of the Attic. We all know how obstinate are suppurations in this part of the ear and how futile, as a rule, is medicinal treatment. As a matter of fact, surgical treatment is our only reasonable resource in cases of this character. But we know, too, that the suppuration at this point often gives rise to little or no embarrassment to the patient beyond the discharge, which is sometimes very slight and, as a rule, is moderate. Under these conditions, which may last for years, the subjects become simply indifferent, callous, and show no inclination whatever to adopt radical treatment; indeed, they are opposed to such a step. Ménière¹ has suggested in such cases a special preparation of chloride of ethyl holding in suspension iodoform. He calls it *ipselène iodoform*. He has tried this remedy in two cases. One was a young man, aged twenty-two years, and in bad health, who had caries of the ossicles and who had been suffering with suppuration of the attic for seven years. The other case was also a man who was about thirty-five years of age, and who had been a sufferer with the same complaint for five years. Both these men had been under treatment for a long time, but without any result. The first patient showed definite improvement after four applications, and Ménière seems to think he will recover. The second case is much better after five applications, the region of the perforation being almost perfectly dry. He attributes this good result to the very active impregnation of the tissue with the remedy, which seems to insinuate itself into the smallest crevices and windings of this region. The agent also favors cicatrization. It is usually applied with a powder blower.

Extraction of the Hammer and Anvil in Chronic Otorrhœa. It will be remembered, perhaps, that I have more than once expressed myself on this subject and called attention to the failures which usually attend the operation. Schroeder² has recently reported the results obtained in one hundred and thirty cases. In most of these cases the discharge had existed for many years, and the subjects were generally of the indigent class. Notwithstanding all this, recovery was obtained in 50 per cent. of the cases. In some cases a new tympanic membrane was formed. He mentions the fact that in Ludwig's clinic the same operation gave 80 per cent. of recoveries. In 88 per cent. he found caries of the anvil, and 40 per cent. of these presented a normal malleus.

¹ Ann. des. mal. de l'oreille, du larynx, etc., December, 1899.

² Archiv für Ohrenheilkunde, 1900, Bd. xlix., No. 1.

An intact anvil associated with a normal malleus was found in only one case. Among the total number of cases fifty-three had an intact malleus, while the anvil was carious, which would seem to show that the offending member in these cases is not the malleus, but the anvil. In 65 per cent. of the cases in which the operation was performed the deafness was ameliorated. In 22 per cent. there was no change and in 13 per cent. the hearing was made slightly worse. In some of the cases the improvement in hearing was surprising, as, for instance, a whisper which before the operation could only be heard right at the auricle, afterward was heard at six metres or even further. In two cases there was facial paralysis, which got well spontaneously in about six weeks.

It is interesting to note the fact that the stapes, as a rule, plays an insignificant rôle; indeed, no rôle at all in this kind of ear trouble. Removal of the stapes in four cases was attended with negative results. I might mention in this connection that Schwendt,¹ of Basel, reports a case where the unintentional removal of the stapes was followed by marked improvement in hearing. It would seem that the stapes in these cases is less likely to undergo caries—a fact which may be attributed to its peculiar surroundings—which means, perhaps, that this ossicle has better sources of nutrition. The report is certainly a remarkable one in the light of what we hear nowadays in the discussions on the tympano-mastoid operation as a cure for chronic otorrhœa, and it is needless to say that such a success is a more substantial one than the success which follows the more radical operation of cleaning out the antrum and tympanic cavity.

Silver Salts in Otorrhœa. Gleason² speaks of the use of the silver salts in the treatment of chronic otorrhœa. He prefers a 5 per cent. solution of protargol. He fills a hypodermatic syringe with this solution and injects it as high up into the attic as possible. I have had a very limited experience with protargol in middle-ear suppuration, but I am every year more and more impressed with the value of solutions of silver nitrate in otorrhœa. My experience leads me to think that its germicidal and astringent properties far outweigh its irritating properties, which latter have always seemed to me slight. I remember one case where the otorrhœa had been going on for thirteen years. A solution of silver nitrate (sixty grains to the ounce) finally put a stop to the discharge, which has never returned. The patient's ear was filled with the solution, which was allowed to remain in until a sensation of warmth was felt, and this was not usually experienced for twenty minutes or a half hour. The ear was then irrigated and in this way

¹ Zeitschr. für Ohrenheilk., Bd. xxxvii., S. 1-11. ² The Laryngoscope, March, 1900.

the silver solution washed out. The ear was always thoroughly irrigated before using the silver solution. This procedure was repeated twice a week, and as well as I remember six applications effected a cessation of the discharge.

Myxofibroma of the Middle Ear. Such growths are seldom met with in the middle ear. Dufour¹ reports a case of myxofibroma of the middle ear, the chief interest of which lies in the fact that excessive hemorrhage followed the removal of the growth. He was compelled to put the patient under chloroform and pack the ear firmly with iodoform gauze, which was removed after four days. We know that the internal carotid sends a minute branch to the floor of the middle ear, and in all probability the walls of this artery were involved in the growth. When the latter was removed the walls of the artery gaped instead of closing, and hence the hemorrhage.

Chronic Aural Catarrh. It is to be hoped that the day is not far distant when we will witness a substantial advance in the therapeutics of chronic aural catarrh. We all recognize what important etiological significance intranasal affections often have in chronic aural catarrh, and I think that the most of us in treating this disease make the treatment of the nares a routine measure; but that there are certain forms of chronic aural catarrh which are absolutely uninfluenced by such treatment has been evident to me for a long time. I think it will be found that in the cases of so-called dry catarrh the latter condition is rarely benefited by intranasal treatment, though the patient might be greatly relieved of his nasal trouble by the treatment. On the other hand, as Tilley and Grant² have pointed out, in the moister forms of aural catarrh, which vary from time to time and are associated with moist sounds on auscultation, excellent results may be obtained by intranasal treatment, especially by the removal of obstructions.

McBride,³ of Edinburgh, has discussed this question recently and speaks of two forms—the sclerotic and the catarrhal. In the former class it is questionable whether operating can ever be of benefit, and it may do harm. In the other variety it is better to operate on a gross nasal lesion which is causing nasal symptoms and upon a nasopharyngeal condition, for these conditions may involve the ear without causing other local symptoms. He suggests as a useful guide the condition of the Eustachian orifices—in other words, as to whether there is redness or not about these orifices. Thus, if a moderate degree of obstruction is present it may affect the ear either by acting as a focus of irritation or by causing diminished air in the post-nasal space, and as a result we

¹ Archives of Otology, February, 1900.

² British Medical Journal, September 8, 1900.

³ Ibid.

will have congestion about the orifices of the tubes. On the other hand, if there is no congestion it is not likely that the nasal affection has anything to do with the ear trouble.

Auditory Results after Removing Adenoids. McKeown,¹ at the last meeting of the British Medical Association, reported the results of hearing tests which were made immediately before and after the removal of adenoid growths. As a rule, there was great improvement, which could not be explained on the ordinary theories of altered intratympanic pressure. McKeown thinks that the relief to the local circulation which follows this operation probably has a great deal to do with the improvement. The venous return is impeded in adenoid cases. Turner² has made similar observations, and his results confirm those of McKeown. At the same meeting the question of operating with the finger-nail was discussed. Watson Williams opposed the finger-nail method, and he was supported by Horne, who thought that the imperfect crushing with the finger-nail would be far more apt to lead to infection of the middle ear, as bruised tissues formed an admirable nidus for bacteria.

I must say in this connection, however, that I have seen a great number of these adenoid cases operated upon with the finger-nail, and I have never seen any harmful reaction as a consequence, and I believe that we may use with advantage the finger-nail to complete an operation begun with the forceps. It is certainly not possible to make the finger as sterile as the forceps, but there is nothing like the end of the finger for telling us exactly what ought to be done, and, while no doubt the method is less radical than the forceps, the older operators experienced good results with it.

Vibratory Massage. Last year mention was made³ in my report of the so-called electro-massage as suggested by Breitung for the treatment of chronic aural catarrh. A few months ago Professor Ostmann,⁴ of Marburg, communicated some results obtained by treating cases of this kind with vibratory massage. He employs an instrument devised by Hirschmayer, of Berlin. Massage is usually kept up for ten minutes, and once the sitting was prolonged to twenty-five minutes. Of course, the external auditory canal must be shut off from the outside air, as the smallest orifice through which the latter can pass would be enough to nullify the effect of the instrument. There are no disagreeable after-effects. He verified the value of the method in four cases; in three of these the deafness had been pronounced incurable. The

¹ British Medical Journal, August 11, 1900.

² Ibid.

³ PROGRESSIVE MEDICINE, March, 1900, p. 396.

⁴ Annales des mal. de l'oreille, du larynx, etc., Tome xxv., No. 2.

deafness in these three cases was consecutive to old inflammation of the middle ear. In the other case there was sclerosis, and the deafness was so marked that the patient could only understand what was being said from the motion of the lips. In all four cases he obtained improvement in periods ranging from one to four months. The application is generally made every day. His opinion is that this kind of massage is indicated in chronic deafness and hypertrophic aural catarrh (chronic). He, of course, advocates the employment of suitable remedies for any catarrh which may exist in either the nasal or pharyngeal region. In those forms of chronic deafness which have followed middle-ear sclerosis, and which have baffled all treatment, the method is especially indicated. The method is contraindicated in acute inflammations and whenever in a case of lesion of the perceptive apparatus conduction is normal. One cannot expect to get any improvement under fifteen days' treatment. Sometimes after four weeks one commences to notice improvement.

HAND MASSEUR. Lucae¹ thinks that eventually our best results will be obtained with the hand masseur. It is true that the number of vibrations per second by the application of this instrument are limited, yet it is free from many of the objectionable features peculiar to other instruments used for this purpose, and it has the additional advantage that each stroke of the masseur can be controlled by the hand.

Pilocarpine in the Treatment of Chronic Non-suppurative Otitis Media. Macuen Smith² has obtained excellent results in this class of cases by the administration of large enough doses of muriate of pilocarpine to cause abundant sweating. He thinks it wise to associate strychnine with the pilocarpine to nullify the depressing effect of the latter upon the heart. He commences with a dose of three or four milligrammes. A dose of one centigramme is ordinarily sufficient. He has found that the treatment greatly relieves the subjective noises. Instead of strychnine one may give the patient a little toddy before the administration of the pilocarpine.

The Surgical Treatment of Chronic Aural Catarrh. The surgical treatment of this bugbear of otology consists, as we know, of several operations—perforation of the drum-membrane, mobilization of the stapes, and extraction of the hammer, of the incus, and of the drum-membrane. All of these operations have been weighed in the balance and have been found wanting by the majority of otologists. Only those cases are suitable for operation where the cranial perception for the watch is preserved (negative Rinne test), and where perforation of the

¹ The Laryngoscope, September, 1900.

² New Orleans Medical and Surgical Journal, February, 1900.

tympanic membrane makes the hearing a little better. According to Moure and Mounier, when this latter condition prevails we can generally hope for improvement from operative measures. If it be true (and I am inclined to think it is so), as Ferrier and others hold, that the so-called middle-car sclerosis is not a disease limited entirely to the middle ear, but that it is a chronic trophoneurosis of all the aural chambers, it is not likely that any of the operations which I have mentioned will really do any good. Not infrequently perforation of the drum-membrane is followed by improvement, but in a few months the patient returns with the same subjective symptoms. And I should add that we generally have the same story to tell of the results of stapedectomy. Botey¹ thinks this operation (stapedectomy) is justifiable only in cases of chronic suppuration, and even here the benefit which follows is usually inconsiderable. In Botey's hands the extraction of the hammer, anvil, and drum-membrane have given but indifferent results, and sometimes the deafness was aggravated. The same author speaks of the disappointing results which usually follow either mobilization or extraction of the stirrup. His experiments on animals, while they do not entirely support his views, will give but poor consolation to the friends of the surgical treatment.

Holmes,² of Cincinnati, reports fifteen hundred operations for hypertrophy of the turbinate bones, and calls attention to the well-known connection between hypertrophic conditions in the nares and chronic aural catarrh. He mentions more especially his method for operating in this class of cases. In all cases he aims to remove as little of the edge of the inferior turbinate as is consistent with the restoration of sufficient breathing space and to save as much of the anterior end of the bone as possible. He inclines the direction of the line of cut rather upward and backward from the lower edge of the anterior end, so as to include as much as possible of the posterior hypertrophy, the saw being pushed till its blunt tip is in the pharynx.

THE MASTOID.

Diabetic Mastoiditis. When mastoiditis occurs in a diabetic one need not refrain from operating on account of the presence of sugar in the urine, for while this latter condition renders the prognosis grave it would doubtless be much graver if pus were allowed to remain in the mastoid. According to Friedrich³ the danger from operating in dia-

¹ *Ann. des mal. de l'oreille, du larynx, etc.*, August, 1900.

² *New York Medical Journal*, October 13, 1900.

³ *Archives of Otolaryngology*, April-June, 1900.

betes consists in the subsequent appearance of sepsis and coma. Both these complications depend upon the amount of sugar in the urine and the acidity of the latter, which conditions when found together in a high degree form a contraindication for the operation. Friedrich reports three operations of this character and one death. He thinks that the omission of narcosis as the greatest danger would be the most important gain in the treatment of diabetic mastoiditis. The diabetic coma which follows the operation is not due to the latter, but to the narcosis, and it is said that the kind of narcotic used is not of so much importance as the metabolic change thereby produced through the increased acidity. The results of local anæsthesia are now so much better than they were a few years ago that we might with its use confidently predict a happier issue in this class of cases.

At the last International Medical Congress MM. Lannois and Furet¹ reported a successful case of mastoid operation in a diabetic, and at the same meeting Noquet referred to the case of a man with diabetic mastoiditis whom he put on antidiabetic treatment and succeeded in dissipating all the mastoid symptoms after local treatment had been tried and had failed. Vacher² reported a very interesting case in this connection. He was called to examine the ear of a diabetic. Otorrhœa was present and the ear had to be cleansed, and for this purpose a weak injection was used. Almost immediately the patient fell into a coma, which lasted four hours. Several months later another examination was made, and the attempt to clean out the ear brought on an attack of coma which ended in death.

Indications for Opening the Mastoid in Chronic Suppuration of the Middle Ear. Not infrequently we operate on these cases when a cure could have been effected without such a step. Indeed, it is difficult to say precisely what are the indications for surgical interference in this class of cases. Of course, in the presence of a meningitis the indications are comparatively clear, but we should remember that even cerebral complications by no means present clear and infallible symptoms. I should say, however, that in the presence of such a probability the mastoid ought to be opened. Of course, when we have an otorrhœa with outward and visible signs of mastoid involvement the indications for opening the mastoid are strong, but when these outward and visible signs are lacking it is very difficult to say what to do. We have at our disposal percussion, auscultation, transillumination, puncture, and radiography, but all these methods are more or less uncertain. We may be certain, however, that an otorrhœa of many years' standing is indicative of a deep-seated affection; in other words, of an osteitis. The reap-

¹ Rev. heb. de laryngol., d'otologie, etc., 1900, No. 35.

² Ibid.

pearance of a discharge after it has been suppressed by local treatment is a proof that some focus exists which escaped our notice. An abundant discharge which sets up immediately after the ossicles have been extracted is a valuable symptom. The sudden cessation of a discharge ought to put us on our guard and prompt us to look for retention. A very fetid and profuse suppuration in spite of treatment is an indication for operation. In such a case we not infrequently have cholesteatoma. Fever is a most valuable symptom, but its absence does not contraindicate an operation, for it is quite possible to have extensive bone involvement without fever. Facial paralysis, prolapse of the posterior superior wall of the external auditory canal, are both symptoms which call for immediate operation. In the absence of all the symptoms just enumerated the conservative treatment should not be prolonged over many months. Milligan says that operation is indicated after twelve months' treatment has failed to put a stop to the discharge. As I have said in a previous communication on this subject, to cure a chronic suppuration by conservative measures is a greater triumph than to do so by operation, and this kind of treatment should always be given a fair trial. We should never lose sight of the fact that the operation is a serious one, and that the danger of permanent impairment of hearing in those who before the operation could hear reasonably well is always present, and, finally, it should not be forgotten that in a number of these cases the healing process is exceedingly protracted. I see no reason, then, to change the views which I expressed on this subject a year ago.

I cannot close the discussion of this subject without referring to some remarks made by Dundas Grant.¹ The indications for this operation, in the opinion of Grant, require the most careful consideration. Pain and vertigo are strong indications unless explained otherwise by visible removable causes. We know that in some cases the vertigo is caused by the pressure of granulations upon the stapes, and that the removal of the former will relieve this distressing symptom. Caries, nerve-deafness, facial paralysis, and, finally, general ill-health are all strong indications for operation. A trace of albuminuria is not a contraindication. The degree of hearing power which the patient retains has also an important bearing upon the case. If the patient can hear a whisper at three feet distance the middle ear is still of value, and below that an operation is admissible. Persistent suppuration in spite of intrameatal treatment is one of the strongest indications for operation. Grant evidently thinks that the responsibility of deciding against the operation is greater than that of deciding for it.

It is needless for me to say that it is a grave mistake to open every

¹ *Lancet*, February 17, 1900.

mastoid which happens to be the seat of pain. We know that it is not an easy thing to establish either anatomically or clinically the existence of pus in the mastoid cells. We know, too, that these cells are simply reservoirs for the exudate which is furnished by the mucous membrane of the ear, and that they show no special reaction under these circumstances; in other words, in a certain group of cases we have a mastoid empyema without any clinical expression for its presence. Of course, in the other class of cases we have reaction on the part of the bone around the pus. We have then a mastoid osteitis, and as a result the classic retro-auricular symptoms. In both instances, of course, had we opened the bone we would have discovered pus, but this discovery does not prove by any means that we had strong reasons for opening the bone; in other words, operative indications in these cases are not as suggestive as we would wish them to be, yet while we are inspecting the external cortex we should not forget that all this time serious and rapid lesions may be progressing in the deeper parts of the bone.

I may mention here that Luc¹ is of the opinion that a simple incision of the soft parts is all that is necessary in a certain number of cases. In a case of retro-auricular swelling accompanied with fluctuation which has developed rapidly and with little pain, presenting a marked tendency to diffusion and with no tympanic suppuration, he makes simply an incision right down to the bone. The incision should be as long as possible, and this should be followed up by making decided pressure around the base of the auricle. I do not see, however, that Luc in his communication has done anything more than to resurrect the incision of Wilde, which we all know the sooner we abandon the better it will be in the long run. Such an operation in the hands of a general practitioner who is far from being an expert may be substituted for the more classic mastoid operation. It will, of course, afford some relief especially in children, and is undoubtedly safer than the regular mastoid operation, but I believe that in the vast majority of cases, certainly in adults, this measure will be found utterly inadequate.

Mastoid Disease with Discharge of Pus through the Eustachian Tube. I take this opportunity of reporting what in my experience was a unique case. The patient was a man, aged fifty-four years, who had had several months previously a discharge from the left ear, but at the time when he came under my care there was no discharge and had been none for at least six months. Examination showed nothing abnormal about the tympanic membrane, but for the past six months there had been a discharge from the Eustachian tube, and sometimes this discharge had been very profuse. There was some pain over the pos-

¹ Ann. des mal. de l'oreille, du larynx, etc., October, 1900.

terior and lower part of the mastoid process and some very slight bulging of the upper and posterior wall of the external auditory canal. What brought the man to me, however, was not the mastoid pain, but the impaired hearing on that side and the offensive discharge into the throat. It turned out that the mastoid was extensively involved, and that the exudate, instead of making a way for itself through the drum-membrane, had passed backward and found its way regularly into the throat.

In this connection I might mention a case which has been recently reported by F. F. White.¹ The patient was a man who had been sitting in a draught and who not long afterward felt intense pain in his right ear. This continued off and on for several months. The hearing was unaffected and there was no discharge. A circumscribed swelling was found behind the auricle, without any fluctuation. He was operated on the next day and the mastoid bone was found swollen and softened. A small cavity about the size of a walnut was discovered in the bone and containing inoffensive pus. Recovery was perfect in three weeks. The practical interest of the case, however, lies in the fact that we can have an acute disease of the mastoid which has not spread to the middle ear just as we see cases of middle-ear suppuration in which the disease after many years has not spread to the mastoid bone.

And I might speak of the history of those cases which were allowed to pass without an operation. Molinié,² of Marseilles, gives us some important information upon this point. He has observed only fourteen cases out of seventy-three recover either spontaneously or under medical treatment. This shows what we have to hope for without an operation. In fifty-five cases there were seven deaths. Five came to the formation of cholesteatomata, eleven ended in fistulous openings, and, finally, in thirty-two cases the condition became chronic and gave rise to the formation of granulation tissue in the antrum and to a diffuse latent mastoiditis, and in some of the cases in this latter category there was very often observed complete quiescence of the condition, the trouble showing itself intermittently in feelings of dulness or of pain excited, perhaps, by cold or by intercurrent ailments. These symptoms can persist for a long time, and all the time may be leading up to a condition of affairs which might jeopardize life in a very short time; all of which goes to show that we must be exceedingly cautious in our prognostications of a mastoiditis left to itself or treated medicinally.

Locating the Site of a Brain Abscess by the Finger. In discussing the question of brain abscess following middle-ear suppuration, Bal-

¹ British Medical Journal, October 20, 1900.

² Rev. heb. de laryn., d'otol., etc., 1900, No. 33.

lance¹ prefers the finger as a means of investigating the site of the abscess. He mentions several cases where the effort to find an abscess in the brain by means of a sound and trocar was absolutely fruitless. He also refers to cases where the sound has been introduced behind the abscess, as was afterward shown at the autopsy. He thinks that the finger can be employed advantageously to locate an abscess in any part of the brain, and he supports this statement with several pertinent cases.

Safety Trepan. In operations upon the mastoid, Suarez de Mendoza² uses what he calls a safety trepan. It is a sort of combination of Stacke's protector with the tubular saw, which latter was previously described by Mendoza.

MISCELLANEOUS.

Ménière's Disease. At the last meeting of the American Otological Society, Dr. C. H. Burnett,³ of Philadelphia, presented some further considerations on the treatment of Ménière's disease. It may be remembered that mention was made in my last year's report of Burnett's method of treating these cases. His paper this year takes up and treats the subject more exhaustively. He maintains that chronic ear vertigo or Ménière's disease is chronologically the latest symptom of catarrhal otitis media. He explains these cases in this way. The stapes is supposed to be impacted in the oval window and its foot pressing upon the fluid in the vestibule. If a recoil from this pressure cannot be obtained by the bulging of the membrane of the round window toward the tympanic cavity, the lymph in the vestibule as well as in the entire labyrinth is unduly compressed, the semicircular canals are irritated, and ear vertigo results. The ear causing the vertigo is always profoundly deaf. He then discusses in detail the symptoms of this disease. When one looks into such an ear one will notice the great retraction of the drum-membrane and ossicles, and in this condition we have the mechanical cause of the ear vertigo. The retracted chain of ossicles, by pressing the stapes into the oval window and holding it there in a condition of undue retraction upon the vestibule and its fluid, compromises the latter space and compresses the labyrinth upon the ampullar nerves in the labyrinth. His treatment, as may be imagined from the etiology of the affection, consists in the removal of the incus and consequent liberation of the stapes. By removing the incus he breaks the retractive force of the tensor tympani and malleus exerted through the incus upon the stapes, and in this way the latter is liberated.

¹ Rev. heb. de laryng., etc., 1900, No. 27.

² Rev. de laryn., etc., August, 1900.

³ Philadelphia Medical Journal, September 22, 1900.

In purulent cases he removes not only the incus, but also remnants of the drum-membrane and malleus. Not only is the vertigo cured, but also the otorrhœa. He gives a very minute description of the operation, for which a general anæsthetic is necessary. He has operated in twenty-seven cases of this character, and in no instance has the operation failed to give relief. He reports two especially interesting cases where he obtained prompt and entire relief from vertigo of one year's standing following mumps. Burnett's work in connection with the treatment of this very trying class of cases is worthy of consideration and offers a promising outlook.

In connection with labyrinthian affections I may refer to some symptoms mentioned by Stein, of Moscow. The labyrinthian gait is characterized by a deviation to either the right or to the left of the median line. The labyrinthian leap presents these typical symptoms. The patient makes several little leaps, which gradually diminish and usually end in a stamping. Again, we have the spasmodic walk and the zigzag walk. According to Stein, these various disorders in gait in labyrinthian disease are more frequent than is generally supposed. A peculiar movement of the eyes is frequently met with in these cases. So far as I know this is the first detailed account of this character of symptoms in labyrinthian disorders.

Grafting of the Labyrinth. Ballance¹ reports a most interesting case of epithelial grafting of the labyrinth after removal of the semicircular canals. The case illustrates the great possibilities of epithelial grafting, and undoubtedly opens up a big field for the future in this variety of work. The patient was a woman, aged fifty-four years, who had been a sufferer with otorrhœa since childhood. She was admitted, having a mastosquamous abscess with vertigo. The mastoid operation was performed, but the discharge from the ear and the vertigo persisted, and deafness was absolute. The semicircular canals were in part removed, the vestibule opened, and the remaining cavity swabbed out with absolute phenol. Ten days later this cavity was grafted, and five days afterward, when the plug was removed, she said she could hear well and was entirely free from vertigo. So far as I know this case is unique and reflects great credit upon the judgment and skill of the operator.

In a discussion of this subject at the last International Medical Congress, Suarez de Mendoza² advocates the employment of pilocarpine, a remedy which has been in use for labyrinthian troubles for several years. He reports several cases where recovery had followed its administration. There were some who expressed a preference for quinine.

¹ Lancet, May 26, 1900.

² Rev. heb. de laryngol., d'otologie, etc., 1900, No. 35.

This, it will be remembered, is the treatment which was usually adopted by Charcot.

The Visual Acuteness of the Deaf. It is a well-known fact that persons having a functional disturbance of one of their senses often have increased functional power of one of the other senses; for instance, we frequently find in the blind remarkably keen hearing and a sense of touch that seems almost supernatural. On the other hand, we know that deaf-mutes by means of the eyes learn to speak and hear. Within the past year Müller-Walle¹ has modified most successfully the methods of teaching deaf-mutes in the art of reading the words from the lips. Deaf-mutes, it is known, are often very successful in understanding what is spoken by those with whom they are constantly thrown, but not what is spoken by strangers. Müller-Walle's method proposes to teach the deaf to understand everybody. The instruction is given by lectures, and the patients are required to take home a text-book on the subject and study it. Stimmel,² who makes a communication on the subject, reported eighteen cases which had been subjected to Walle's method of treatment. Of these eighteen, six between eighteen and thirty-six years of age had learned in the space of a few months to interpret speech with great rapidity. Ten reached a very advanced stage in the course, but were not so proficient as the six just mentioned; still their condition was a great improvement upon what it was before they commenced the treatment. The other two lacked perseverance to continue the treatment. While the exact details of the treatment are not given, it seems to be a method which is deserving of trial and encouragement, as evidenced by the discussion which it evoked in the meeting at which the subject was first brought forward.³ The method is evidently based upon the principle of utilizing to the utmost the sharp visual acuity of the deaf.

The Aural Changes in Leucocythæmia. Some months ago Schwabach⁴ made a communication upon this subject, but more recently Weber⁵ has given us a very complete description of the changes which are found in the ear in leucocythæmia. His report was made to the Royal Medical and Surgical Society. He describes a case as follows: The patient was a man, aged thirty-one years, suffering from advanced leucocythæmia. He had had malaria a few years previously. He died from collapse following internal hemorrhage. During life the ophthalmoscope revealed a leucæmic retinitis. Six months before death he was attacked with acute ear symptoms, headache, vertigo, and vomiting,

¹ Münch. med. Wochen., 1900, No. 47.

³ Leipzig Medical Society, October 17, 1900.

⁴ Zeitschr. für Ohrenheilkunde, 1900.

² Ibid.

⁵ Lancet, March 3, 1900.

and the author concluded that the symptoms pointed to a leucocythemic condition of the internal ear. Soon after this the man became quite deaf. Anatomical examination of the ears showed that a portion of the scala tympani and of the perilymphatic spaces of the semicircular canals were filled up with newly formed fibroid and bony tissue. The scala vestibuli, canalis cochleæ, and vestibule showed only slight changes, while cross-sections of the nerve-trunks revealed nothing abnormal. From a comparison of the various cases the conclusion was reached that the pathological appearances presented by the internal ear after death differed in different cases, partly in accordance with the length of time which had elapsed since the acute aural symptoms and the death of the patient.

Post-mortem study of similar cases has pointed to the following symptoms as having probably existed: Vertigo, headache, vomiting, and deafness marked the occurrence of more or less extravasations of blood in the semicircular canals and cochlea, the process being practically simultaneous in both ears and also symmetrical. While lymphocytic infiltration and hemorrhages would often be found in various parts of the ear after death the labyrinthian hemorrhage was probably the cause of the aural symptoms. The author then gives a more detailed account of the anatomical changes, and then goes on to discuss the occurrence of Ménière's symptoms in this class of cases. He makes the statement that cases of this kind have thrown a great deal of light upon cases associated with constitutional troubles other than leucocythæmia, such, for instance, as arterio-sclerosis, gout, syphilis, renal fibrosis, and the various cachectic conditions in which hemorrhages often occur. The exact pathological nature of the ear affection could not often be determined with certainty from the clinical symptoms.

At the same meeting Mott related a case resembling in some points the cases reported by Weber. The patient was a man, aged thirty-eight years, who complained of pains in the head and abdomen and some deafness, which latter condition had developed suddenly. Examination revealed the fact that he had a very much enlarged liver and spleen, while the blood-count showed an enormous increase in the number of leucocytes, of which there were about as many as there were red blood-corpuscles. Seven days after admission he became stone-deaf and three days later he died. Anatomical examination showed hemorrhage into the cochlea. The hemorrhage into the semicircular canals accounted for the loss of equilibrium—a symptom which had been very conspicuous. This and the deafness were explained by the hemorrhage into the cochlea and labyrinth.

Hysterical Deafness. In connection with this subject Barth¹ reports a very interesting case of a girl who became suddenly deaf as a result

¹ Deutsche med. Wochenschrift, May 31, 1900.

of fright. When Barth first saw her she had been deaf for ten weeks. The case is rather remarkable, because the integrity of her ear for music was unimpaired. She could, without any accompaniment, sing a long melody with perfect accuracy. The case seems to afford strong evidence in favor of the theory that there is a certain tract in the cerebral nervous system which belongs to the musical hearing.

Local Anæsthesia in the Ear. It may be remembered that I mentioned last year a new local anæsthetic which was suggested by Bonain, of Brest. It consisted of equal parts of cocaine, menthol, and pure carbolic acid. This is applied several minutes before operation, and the latter is rendered painless. We know that the aqueous solution of cocaine appears to have little if any effect upon the normal drum-membrane, and even when the membrane is perforated the effect is slight as compared to its effect when used, for example, in the eye. The use of eucaine, as suggested by Horn and others, possesses the same disadvantages, and its inefficiency is due no doubt (as is the case with cocaine) to the vehicle used. The difficulty of producing anæsthesia in the drum membrane and middle ear with these solutions lies in the fact that the nerve-endings are protected by tissues which are able to resist the penetrating properties of water through their substance. In this connection Dr. A. A. Gray,¹ of Glasgow, has been experimenting with a view of getting some vehicle which would dissolve either cocaine or eucaine, and at the same time penetrate the tissues rapidly without destroying them. He tried alcohol as a vehicle, and then various combinations of the volatile oils with alcohol, but they all proved more or less unsatisfactory. He finally tried a mixture of aniline oil and alcohol, and succeeded admirably. The following was the character of this mixture: Five parts of cocaine, fifty parts of aniline oil, and fifty parts of dilute alcohol, giving a strength of a little less than 5 per cent. cocaine. There is no pain following the instillation of this mixture, only a slight sensation of cold in the ear, and at the end of five minutes anæsthesia is apparently complete. One of the cases experimented upon was the subject of a severe reflex aural cough, and the slightest manipulation in the external auditory canal would usually bring on a fit of coughing. This was controlled absolutely by the mixture. Incisions into the drum-membrane and removal of granulations were all carried out painlessly. In only a few cases did Gray fail to get satisfactory anæsthesia, and in these the drum-membrane was thickened, white and dense, the result of sclerotic processes which had been going on for fifteen years or more. In these cases he has somewhat changed the formula, and uses ten parts of cocaine, thirty parts of absolute alcohol, and seventy parts of aniline oil.

¹ Lancet, April 27, 1900.

The efficacy of this solution is largely due to its dehydrating properties, as would be inferred from the fact of the aniline and alcohol which are present. These agents abstract water from the tissue, and the latter contracts. The fluid then passes through the interstices produced by the contraction into the deeper layers until it reaches the nerve-endings in the innermost layer.

Aural Complications of Ozæna. I have long been impressed with the frequency with which aural complications are found with atrophic rhinitis. Locomotive engineers are not infrequently affected with this disease, and I have invariably found in these subjects abnormal middle-ear conditions. It is interesting to note that Lacroix¹ has made this question the subject of some clinical study. Among forty-two patients who were affected with ozæna thirty were found to have aural trouble. Often these troubles were slight, but they were unmistakably present. The aural complication which was most often found was chronic aural catarrh, the drum-membrane appearing usually dull, grayish looking, and retracted. The functional troubles consisted generally in deafness, which was pronounced in two cases, and only slight in the others. The last fourteen complained only of subjective noises and transient deafness. This, then, gives an idea of the frequency with which the ear is involved in ozæna, and, as I have said, while the troubles are often slight they are usually there, and in the majority of instances lead to worse conditions. By reason of their clinical aspect Lacroix is disposed to regard this variety of ear trouble as a true chronic ozæna of the middle ear, and proposes for it the name of "ozæna of the ear."

The Education of the Deaf-mute. This seems to me of such practical importance to all medical men that in spite of my rather lengthy discussion of the subject in my last year's report, I shall refer to the last utterances of Urbantschitsch on his system of educating this unfortunate class of people. Physicians generally regard these cases as hopeless, and offer no encouragement in the way of treatment. It will be remembered, perhaps, that the method of Urbantschitsch has for its object: 1. The arousing or awakening of the attention by acoustic impressions. 2. The proper interpretation of what is heard, and, finally, the gradual increase of the acoustic sensibility. It is interesting to note the fact that the author of the method insists upon the possibility of obtaining success even in cases of deafness following cerebro-spinal meningitis. Bezold says that these "auditive exercises" are valueless in those deaf-mutes who do not hear the tones of the tuning-fork, a^1 ——— b^2 . Urbantschitsch² contradicts this statement flatly, and cites cases of this kind where he has obtained beautiful results.

¹ Ann. des mal. de l'oreille, du larynx, etc., T. xxv., No. 2.

² Ibid., October, 1900.

At the last meeting of the International Medical Congress he once more calls our attention to the results which he has obtained in the treatment of deaf-mutes by his method, and it is a significant fact that during the past year he has brought many over to his way of thinking. The success of the method depends upon their daily duration, upon the existing strength of the hearing, and upon its capacity for development, and, finally, upon the intellectual capacity of the patient and his application to the exercises. In some particular cases one can awaken by degrees the remains of hearing where this faculty appears to be absolutely lacking and where it is susceptible of ultimate development. The method seems to exercise a favorable influence upon the pronunciation—that is to say, upon its roughness and modulation—and tends to bring about as a consequence a decided amelioration in the social relations of life. In spite of such men as Politzer, Bezold, and Gradenigo, I believe that an enormous amount of good will result from the labors of Urbantschitsch.

INDEX.

- A**BDUCENS paralysis, 198
- A**bscess, Bezold's, 129
- of anterior part of the mastoid and furunculosis of the external auditory canal, differential diagnosis of, 402
 - of brain, location of site of, by the finger, 424
 - of lung, 93
 - retropharyngeal, 45
- Actinomycelial dacryoliths, 329
- growth form of bacillus diphtheriæ, 321
- Actinomyces capræ silberschmidt, 329
- murium, 330
 - protea, 328
- Actinomycosis, facial, 24
- Adenitis, cervical, 287
- Adenocarcinoma in teratoma, 361
- Adenoid growths of the nasopharynx, 258
- surface carcinoma, 359
- Adenoids, auditory results after removing, 418
- Adenoma, malignant, 360
- Agglutination, 306
- mechanism of, 306
 - of bacillus diphtheriæ, 308
 - of proteus vulgaris, 309
- Air passages, upper, diseases of, 257
- Alimentary tract, diseases of, 246
- Amyloid growths, local, 348
- Anæsthesia in children, 289
- local, in the ear, 429
- Animal organisms in tumors, 356
- Ankylosis, temporomaxillary, 36
- Anterior poliomyelitis, 222
- Anticytotoxins, 299
- and cytotoxins, 291
- Antitoxins and globulins, 322
- Antrum, chronic suppuration of, 378
- Anvil, extraction of, 415
- Appendicitis, 252
- Arthritis deformans and allied affections, 284
- Asphyxia, 237
- Attic, chronic suppuration of, 415
- treatment of, 415
- Auditory results after removing adenoids, 418
- Aural catarrh, chronic, 417
- surgical treatment of, 419
 - changes in leucocythemia, 427
 - complications of ozæna, 430
- Auricle, detachment of, 402
- hæmatoma of the, 403
- B**ACILLI, new acid-proof, and further studies in this group, 325
- of hog-cholera group, 318
 - pathogenic, 315
- Bacillus acnes, 331
- aërogenes capsulatus, 316
 - coli and its many allied forms, 318
 - diphtheriæ, actinomycelial growth form of, 321
 - agglutination of, 308
 - and allied organisms, 319
 - dysenteriæ, 317
 - glanders, the hypomycetic nature of, 331
 - O. and B. paracolon, 319
 - pseudotuberculosis murium, 330
 - pyocyaneus and its pigments, 315
 - tuberculosis, improved culture medium for, 328
- Bacteria, bacteriolysins from digested, 305
- filamentation of, 310
 - variation among pathogenic, 312
- Bactericidal action of serum, 301
- Bacteriolysins from digested bacteria, 305
- Bacteriolytic and other properties of bile, 304
- Bandages, application of, 290
- Benign tumors, 366
- Bezold's abscess, 129
- Bile, bacteriolytic and other properties of, 304
- Bladder, malignant tumors of, 270
- Blastomycetes, experiments with, 334
- pathogenic oidia and, 332
 - distinction between, 332
 - phagocytosis of, 336
- Blood, condition of, in typhoid fever, 187
- corpuscles, clumping of, 310
 - diseases of, 286
 - in children, 286
 - in croupous pneumonia, 145
 - letting, local, and cold applications in the treatment of acute inflammation of the middle ear, 406
- Bones, diseases of, 286
- Brain abscess, locating site of, by the finger, 424
- cysts and tumors of, 122
 - skull and, 110
 - wounds of, 111
- Breast, 100
- carcinoma of, 100
 - closing the wounds in operating for, 107

- Breast, carcinoma of, diagnosis of, 105
 early operation for, 102
 increase of, 105
 oöphorectomy in, 108
 recurrence of, 108
 Bronchiectatic cavities, 95
 Bronchopneumonia, 70, 263
 Bullet wounds, 61
- CANAL**, a dehescence in the lower wall of the bony, 403
- Cancer of lip, 28
 skin, 26
- Carcinoma, adenoid surface, 359
 calcified, 361
 epitheliale adenoides, 359
 interesting forms of, 359
 of breast, 100
 closing the wound in operating for, 107
 diagnosis of, 105
 early operation for, 102
 increase of, 105
 oöphorectomy in, 108
 recurrence of, 108
 of lip, 28
 of skin, 26
- Cartilage, ochronosis and pigmentation of, 349
- Catarrh, chronic aural, 417
- Cerebral abscess in typhoid fever, 221
 surgery, 110
- Cerumen, epileptiform attacks due to a plug of, 401
- Cervical adenitis, 287
 sympathetic, cutting, in epilepsy, 120
 ganglia, tumor of the, 24
- Chest, 55
 hemorrhage from penetrating wounds of, 55, 59
- Chicken-pox, 149
- Children, anæsthesia in, 289
 application of bandages in, 290
 details of operating on, 289
 diseases of, 237
 practice of surgery among, 287
- Cholesteatomatous endothelioma of the choroid plexus, 364
- Chorea, 274
 treatment of, 274
- Choroid plexus, cholesteatomatous endothelioma of the, 364
- Chronic aural catarrh, 417
 suppurative middle-ear disease and its results, 128
- Ciliated cells as emboli, 344
- Circulatory system, diseases of, 266
 in typhoid fever, 266
- Circumcision and phimosis, 271
- Cleft palate, 40
- Clumping of blood-corpuscles, 310
- Cocci, pathogenic, 313
- Cold, tissue changes produced by, 342
- Colon and typhoid bacilli, 318
 bacillus, chief distinguishing features of, 318
- Conjunctival and other routes of infection, 310
- Constipation, 252
- Convulsions in typhoid fever, 193
- Cretinism, 280
 treatment of, 280
- Croupous pneumonia, 142
 complications, 143
 abdominal symptoms, 143
 involvement of parotid gland, 143
 condition of blood in, 145
 epidemics, 142
 in children, 149
 sequelæ, 149
 serum treatment, 146
 symptomatology, 142
- Crystalline lens, regeneration of, 337
- Cyanosis, 237
- Cystic lymphangioma in the abdomen, 369
- Cystitis in typhoid fever, 201
- Cysts and tumors of the brain, 122
 cervical, 369
 rare forms of, 368
 splenic, 269
- Cytolysins, deductions from the study of, and practical application, 300
 theories of, 396
- Cytotoxins and anticytotoxins, 291
- D**AY terrors, 277
- Deaf-mute, education of, 430
 visual acuteness of the, 427
- Deafness, hysterical, 428
- Degenerative changes in muscles, 342
- Dehescence in the lower wall of the bony canal, 403
- Diabetes, 284
- Diabetic mastoiditis, 420
- Diarrhœas of infancy, 248
 treatment of, 249
- Diet in typhoid fever, 210
- Diphtheria, 150
 in horses, 322
 in lower animals, 150
 toxin and antitoxin, local action of, 322
 treatment of, 150
- Diseases due to faulty nutrition in children, 281
 scurvy, 281
 rickets, 283
 treatment of, 283
 general, of children, 284
 of alimentary tract in children, 246
 appendicitis, 252
 constipation, 252
 cyclic vomiting, 257
 diarrhœa of infancy, 248
 diseases of the liver, 256
 geographic tongue, 247
 hypertrophic pyloric stenosis, 247
 intussusception, 253
 malignant disease of the stomach, 247
 peritonitis, 254

- Diseases of alimentary tract in children—
 proctitis, 255
 prolapse of the rectum, 255
 thrush, 246
 of circulatory system in children, 266
 acquired heart disease, 266
 congenital heart disease, 269
 treatment of, 268
 of blood, lymph nodes and bones, 286
 of children, 237
 of ear, 260
 of genito urinary system in children, 269
 malignant tumors of the bladder, 270
 nephritis, 269
 nocturnal enuresis, 270
 phimosis and circumcision, 271
 sarcoma of the kidney, 272
 of nervous system in children, 272
 chorea, 274
 treatment of, 275
 cretinism, 280
 treatment of, 280
 day terrors, 277
 epidemic paralysis, 281
 head-shaking, 275
 hydrocephalus, 279
 hysteria, 277
 meningitis, 278
 lumbar puncture for, 278
 neuroses of early life, 272
 night terrors, 276
 of new-born, 237
 asphyxia, 237
 cyanosis, 237
 hemorrhage, 238
 imperforate rectum, 238
 ophthalmia neonatorum, 238
 premature infants, 238
 of respiratory organs in children, 261
 bronchopneumonia, 263
 empyema, 264
 treatment of, 265
 lobar pneumonia, 263
 pneumonias of children, 261
 of upper air passages in children, 257
 adenoid growths of the nasopharynx, 258
 tonsils, 257
- Dura, tumors of, 365
 Dysentery, 230
 bacillus of, 317
- E**AR, acute inflammation of middle, 403
 clinical features, 404
 diseases of, 260
 external, 399
 lupus of, 399
- Ear, local anæsthesia in the, 429
 middle, 403
 acute inflammation of, 406
 blood-letting in, 406
 cold applications in, 406
- Education of deaf-mutes, 430
- Elastic elements, reproduction of, 338
 fibres, fragmentation of, 347
 tissue in tumors, 358
- Emboli ciliated cell, 344
 liver cell, 344
 osteoblasts as, 345
- Embolism, fat, 346
 of fat cells, 345
 of giant cells of bone-marrow, 344
 of parenchymatous cells, 344
 of placental cells, 344
- Empyema, 264
 acute, 72
 chronic, 86
 diagnosis of, 75
 encysted, 86
 in typhoid fever, 206
 pulsating, 87
 surgical treatment of, 81, 82
 treatment of, 77, 265
- Endothelioma and other tumors of the dura, 365
 calcified, 365
 cholesteatomatous, of the choroid plexus, 364
 of Gasserian ganglion, 125
 of gastro-intestinal tract, 364
 of left superior pulmonary vein, 364
 of testicle, intravascular growth of, 363
- Eosinophile leucocytes in tumors, 358
- Epilepsy, 118
 cutting the cervical sympathetic in, 120
- Epileptiform attacks due to a plug of cerumen, 401
- Epistaxis, 376
 etiology of, 377
- Epitheliolysin, 294
- Etiology of tumors, 351
- Eustachian tube, mastoid disease with discharge of pus through, 423
- Exophthalmic goitre, 17
- External auditory canal, sarcoma of, 403
 ear, 399
- F**ACE, surgery of, 124
 Facial actinomycosis, 24
 nerve, involvement of, in middle-ear disease, 413
- Fat cell embolism, 345
 embolism, 346
 necrosis, 348
- Ferriferous elastic fibres in giant cells, 347
- Finsen's method of treating lupus, 31
- Fistula, salivary, 44
- Foreign bodies in the lung, 67
- "Fourth disease," 161-163
 differential diagnosis between scarlet fever, rubella, and, 163
- Fractures of bones of nose, 32
 of skull, 113

Fractures of skull, operations for, 114

Frontal sinus, 383

chronic suppuration of, 379-383
operation for, 383

Frontomaxillary suppuration, 379

Furunculosis of external auditory canal and abscess of the anterior part of the mastoid, differential diagnosis of, 402

GANGRENE in typhoid fever, 187

of lung, 95

Gasserian ganglion, removal of, 125
endothelioma of, 127

Gastro-enteritis, otitis media following, 409

General pathological histology, 336

Genito-urinary complications of typhoid fever, 201

system, diseases of, 269

Glanders, serum diagnosis in, 308

Glands, salivary, 43

Glioma, 370

Globulins and antitoxins, 322

Glossitis, 187

Goitre, 17

exophthalmic, 17

treatment of, 23

wandering, 18

Grafting of the labyrinth, 426

Granulation tissue, treatment of, 414

Graves' disease, 17-21

Grippe as a factor causing middle-ear disease, 412

HÆMOLYSINS, 292

Hæmoptysis in wounds of the chest, 64

Hæmatoma of the auricle, 403

Hammer, extraction of, 415

Hand masseur in middle-ear disease, 419

Head-shaking, 275

Heart, congenital multiple rhabdomyoma, 366

disease, acquired, 266

congenital, 269

treatment of, 268

myxofibroma of the, 367

pericardium and, 95

wounds of, 99

Hemiplegia, 196

Hemorrhage in children, 238

from penetrating wounds of the chest, 55-59

Histology, general, of tumors, 358

pathological, 336

Hog-cholera group, bacilli of, 318

Hydrocephalus, 279

and idiocy, 132

Hydrotherapeutics, 214

Hypertrophic pyloric stenosis in infancy, 247

Hypomycetic nature of bacillus glanders, 331

Hysteria, 277

Hysterical deafness, 428

IDIOCY and hydrocephalus, 132

Infant feeding, 239

Infantile respiratory spasm or congenital laryngeal stridor, 393

Infection, conjunctival, and other routes of, 310

phenomena of, 312

Infections, pathology of the, 301

Infectious diseases, including acute rheumatism, croupous pneumonia, and influenza, 133

Influenza, 139

as a factor causing middle-ear disease, 412

complications of, 139

symptomatology of, 139

Intestinal lesions, absence of, in typhoid fever, 209

Intracranial complications in middle-ear disease, 411

Intussusception, 253

JAWS, surgery of, 24

tumors of, 38

Jugular vein, resection of, 54

KIDNEY, sarcoma of, 272

LABYRINTH, grafting of the, 426

Laryngeal affections in typhoid fever, 395

stridor, congenital or infantile respiratory spasm, 393

Laryngology and rhinology, 371

Larynx, 198

complete excision of, 392

malignant disease of, 385

after-treatment of, 389

treatment of, 386

partial excision, 392

Leucocythæmia, aural changes in, 427

Leucocytic emigration, action of chemical substances on, 340

Leucocytolysin, 296

Lip, cancer of, 28

Lipoma, origin of multiple, 368

Lips, plastic operations upon the, 32

surgery of, 24

Liver cells as emboli, 344

diseases of, 256

Lobar pneumonia, histology of, 314

in children, otitis media and earache in, 409

Lumbar puncture, 278

Lung, abscess of, 93

foreign bodies in, 67

gangrene of, 95

Lupus, 31

of the ear, 399

Lymph nodes, diseases of, 286

Lymphangioma, cystic, in the abdomen, 369

Lymphoma, 368

- MALARIA**, 170
 etiology and prevention, 170
 general paralysis in, 175
 mosquito theory, 173
 nervous complications, 175
 treatment of, 178
- Malignant adenoma**, 360
 diseases of the larynx, 385
 after-treatment, 386
 treatment of, 386
 tumors, parasitic, etiology of, 353
- Malta fever**, 235
- Massage, vibratory**, 418
- Masseur, hand**, in middle-ear disease, 419
- Mastoid**, 420
 disease, with discharge of pus through the Eustachian tube, 423
 in chronic suppuration of middle ear, indication for operation, 421
- Mastoiditis, diabetic**, 420
- Maxillary sinus**, 380
 radical operation, 380
 treatment by lavage, 380
- Measles**, 154
 complications, 156
 pathology, 156
 prophylaxis, 156
 relapse, 156
 sequelæ, 157
 symptoms, 155
- Melanosarcoma of the skin**, 362
- Ménière's disease**, 425
- Meningitis**, 195, 278
- Micrococcus lanceolatus**, 309
 tetragenous septicus, 315
- Micro-organisms, pathogenic**, 312
- Middle ear**, 403
 acute suppurative inflammation of the, 403
 clinical features, 404
 disease, chronic suppuration and its results, 128
 intracranial complications, 411
 indication for opening mastoid in chronic suppuration of the, 421
 influenza as a factor, 412
 involvement of facial nerve in, 413
 treatment in children, 408
 with boiled and distilled water, 414
 myxofibroma of the, 417
- Miliary tuberculosis, genesis of**, 324
- Milk, adapted**, 240
 its production and use as an infant food, 244
- Muscles, degenerative changes in**, 342
- Mycobacterium lacticola friburgense**, 327
- Myeloma, multiple**, 361
- Myocarditis**, 207
- Myoma and adenomyoma**, 367
- Myxofibroma of heart**, 367
 of middle ear, 417
- NASAL accessory sinuses**, 378
- Nasopharynx, adenoid growths of**, 258
- Neck, surgery of**, 24
 tubercular glands of the, 49
- Necrosis, fat**, 348
- Nephritis**, 269
 complicating varicella, 150
 in typhoid fever, 201
- Nephrolytic serum**, 295
- Nervous system, diseases of**, 272
- Neuritis, peripheral**, 198
- Neuroses of early life**, 272
 treatment of, 273
- New-born, diseases of**, 237
- Night-terrors**, 276
- Nocturnal enuresis**, 270
- Nose, fracture of the bones of**, 32
 tuberculosis of, 371
- Nutrition, faulty, diseases of**, 281
- () CHRONOSIS and pigmentation of cartilage produced by formalin**, 349
- Œsophagus, stricture of**, 223
- Oidia and blastomycetes**, 332
 distinction between, 332
- Oöphorectomy in cancer of the breast**, 108
- Oöspora proteus**, 328
- Operating, details of, in children**, 289
- Operations, plastic, upon the lips**, 32
 rhinoplastic, 34
- Ophthalmia neonatorum**, 238
- Orchitis**, 203
- Osteoblasts and emboli**, 345
 plasma cells and, 340
- Osteomyelitis**, 287
- Otitis media and earache in lobar pneumonia of children**, 409
 following gastro-enteritis, 409
- Otology**, 399
- Otorrhœa, chronic, extraction of hammer and anvil in**, 415
 silver salts in, 416
- Ozæna, aural, complications of**, 430
- PALATE, cleft**, 40
- Paralysis, epidemic**, 281
 general, 175
 in typhoid fever, 192
 pseudohypertrophic, 222
- Parasitic etiology of malignant tumors**, 353
- Parenchymatous cells, embolism of**, 344
- Parotid glands, involvement in croupous pneumonia**, 143
 periepithelioma of, 365
- Pathogenic bacilli**, 315
 cocci, 313
 micro-organisms, 312
 oidia and blastomycetes, 332
 yeasts, 333
- Pathology**, 291

- Pathology of infections, 301
 Perforation in typhoid fever, 187
 Pericarditis, purulent, 95
 operation for, 96
 Pericardium and heart, 95
 Periepithelioma of the parotid gland, 365
 Peritonitis, 254
 Pertussis. *See* Whooping-cough.
 Phagocytosis, 340
 of blastomycetes, 336
 Pharyngotomy, 46
 Phimosis and circumcision, 271
 Placental cells as embolism, 344
 Plague, 224
 diagnosis of, 228
 in lower animals, 225
 prophylactic, 229
 treatment of, 228
 Plasma cells and osteoblasts, 340
 Pleurisy in typhoid fever, 204
 Pneumococcus and its toxins, 313
 Pneumonia, broncho-, 263
 croupous, 142, 263
 abdominal symptoms, 143
 complications, 143
 condition of blood, 145
 epidemics, 142
 in children, 149, 261
 involvement of parotid gland, 143
 sequelæ, 71, 149
 serum treatment of, 146
 surgical aspects of, 69
 symptomatology, 142
 treatment of, 145
 lobar, 142, 263
 histology of, 314
 Pneumothorax, 88
 induced by Murphy's method, 89
 tubercular, 65
 Premature infants, 238
 Proctitis, 255
 Proliferation, 340
 Protargol in otorrhœa, 416
 Proteus vulgaris, agglutination of, 309
 Pseudohypertrophic paralysis, 222
 Pulmonary infarct, 206
 tuberculosis, mixed infection in, 323
 surgical treatment of, 83-88
 vein, endothelioma of, 364
 Pulse in typhoid fever, 223
- R**AY fungi, 328
 Rectum, imperforate, 238
 prolapse of, 256
 Regeneration and other cellular processes, 336
 of elastic filaments, 338
 of the crystalline lens, 337
 Resection of the jugular vein, 54
 Respiratory organs, diseases of, 261
 system in typhoid fever, 204
 Retropharyngeal abscess, 45
 Rhabdomyoma, congenital multiple, of the heart, 366
 Rhabdomyosarcoma, with hyaline degeneration in voluntary muscles, 362
 Rheumatism, acute articular, 133
 epidemic, 138
 etiology of, 133
 Rhinology, 371
 Rhinoplastic operations, 34
 Rickets, 282
 treatment of, 283
 Rubella, 163
- SACCHAROMYCES**, granulomatous, 334
 guttulatus, 333
 ruber, 334
 tumefaciens albus, 333
 Salivary concretions, 44
 fistula, 44
 glands, 43
 Sarcoma, interesting forms of, 361
 of external auditory canal, 403
 of kidney, 272
 Scarlet fever, 157-163
 etiology of, 157
 hemiplegia, 161
 rash, 160
 Scurvy, 281
 Septic thrombosis of the sinuses, 130
 Serum, bactericidal action of, 301
 diagnosis in glanders, 308
 nephrolytic, 295
 substitutes, 307
 Silver salts in otorrhœa, 416
 Sinus, frontal, chronic suppuration of, 383
 operation for, 383
 suppuration of, 379
 maxillary, 380
 radical operation, 380
 treatment by lavage, 380
 Sinuses, nasal accessory, 378
 Skin, cancer of, 26
 melanosarcoma of, 362
 Skull and brain, 110
 fractures of, 113
 operations for, 114
 Smallpox, 169
 treatment of, 169
 Splenomegaly, primary, 287
 Spermotoxin, 295
 Spondylitis, typhoid, 224
 Stomach, malignant disease of, 247
 ulcer of, 247
 Streptococci, precipitation of albumin by pathogenic, 315
 Suppuration in typhoid fever, 209
 Surgery, cerebral, 110
 of head, neck, and chest, 17
 of tongue, 24
 practice of, among children, 287
 Surgical aspects of pneumonia, 69
- T**AMPON in wounds of the chest, 56
 Temporomaxillary ankylosis, 36
 Teratoma, adenocarcinoma in, 361

- Testicle, intravascular growth of endothelioma of, 363
 Tetany, 276
 Thorax, construction of, 58
 Throat, tuberculosis of, 371
 Thrombosis, septic, of the sinuses, 130
 Thrush, 246
 Thyroid gland, suppuration of, 223
 Thyrotomy, 92, 388
 Tissue changes produced by cold, 342
 Tongue, geographic, 247
 surgery of, 24
 Tonsillitis, 138
 Tonsils, diseases of, 257
 Toxins, phagocytosis and proliferation, 340
 Tracheotomy, 46
 Treatment of abscess of the lung, 94
 of actinomycosis, 25
 of acute inflammation of the middle ear, 406
 of cancer of lip, 29
 of skin, 26
 of chorea, 275
 of chronic suppuration of the attic, 415
 of cretinism, 280
 of diarrhoea in infancy, 249
 of diphtheria, 150
 of empyema, 77, 265
 of exophthalmic goitre, 23
 of granulation tissue, 414
 of heart disease, 268
 of lupus, 31
 Finsen's method, 31
 of malaria, 178
 of malignant disease of the larynx, 386
 of maxillary sinus, 380
 of middle-ear disease in children, 408
 with boiled and distilled water, 414
 of neuroses of early life, 273
 of plague, 228
 of pneumonia, 145, 262
 serum, 146
 of rickets, 283
 of smallpox, 169
 of typhoid fever, 210
 of whooping-cough, 152
 of wounds of the chest, 55
 surgical, of aural catarrh, 419
 of pulmonary tuberculosis, 87, 88
 Trepan, safety, 425
 Tubercular cavity, drainage of, 88
 glands of neck, 49
 pneumothorax, 65
 Tuberculosis group, histological lesions of
 acid-proof bacilli of, 326
 genesis of miliary, 324
 its germ and allied organisms, 322
 mixed infection in pulmonary, 323
 of nose and throat, 371
 Tuberculous toxins and tissue lesions, 322
 Tumors and cysts of the brain, 122
 Tumors, animal organisms in, 356
 elastic tissue in, 358
 eosinophile leucocytes in, 358
 etiology of, 351
 frequency of, 350
 general histology of, 358
 interesting benign, 366
 malignant, of the bladder, 270
 parasitic etiology of, 353
 mixed, 365
 of cervical sympathetic ganglia, 24
 of dura, 365
 of jaw, 38
 Typhoid and colon bacilli, 307
 chief distinguishing features of, 318
 bacilluria, 201
 fever, 178
 abducens, paralysis in, 198
 anterior poliomyelitis, 222
 cerebral abscess in, 221
 circulatory system in, 206
 complications of, 187
 condition of the blood, 187
 convulsions, 193
 course of, 181
 cystitis in, 201
 diet in, 210
 empyema in, 206
 epididymitis in, 203
 eruption of, 182
 gangrene in, 187
 genito-urinary system in, 201
 glossitis in, 187
 hemiplegia in, 196
 hydrotherapeutics, 214
 intestinal lesions, absence of, 209
 larynx in, 198
 laryngeal affections in, 395
 meningitis in, 195
 medication in, 216
 mode of onset, 181
 myocarditis in, 207
 nephritis in, 201
 nervous complications, 191
 occurrence in children, 219
 orchitis in, 203
 paralysis in, 192
 perforation, 187
 peripheral neuritis, 198
 peritoneal complications, 187
 pleurisy in, 204
 preventive inoculation, 216
 prophylaxis in, 179
 pulmonary infarct in, 206
 rapid pulse in, 223
 relapse, 207
 relationship of domestic animals to, 178
 respiratory complications, 204
 sequelæ of, 221
 serum diagnosis in, 180
 stricture of the œsophagus, 223
 suppuration in, 209
 of thyroid gland in, 223
 treatment of, 210
 spondylitis, 224

- V**ACCINATION, 166
 accidental eruptions, 169
Varicella, 149
 nephritis, complicating, 150
Variola. *See* Smallpox.
Vibratory massage, 418
Visual acuteness of the deaf, 427
Voluntary muscles, rhabdomyosarcoma with
 hyaline degeneration in, 362
Vomiting, cyclic, 257
- W**HOOPING-COUGH, 152
 etiology of, 152
 treatment of, 152
Wounds, bullet, 61
 of brain, 111
 of heart, 99
- Y**EASTS, pathogenic, 333

P
Med
P
1901
Mar.

Progressive medicine

GERSTS

